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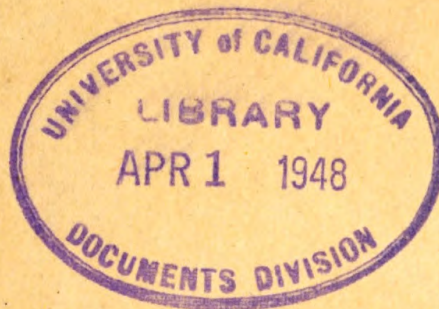
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TECHNICAL MANUAL

BROWNING MACHINE GUN, CAL. .50, M2,  
WATER-COOLED, AND MOUNTS

2 AUGUST 1943





Doc well  
gift  
man live



# BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

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\*This manual supersedes TM 9-226, dated 10 December 1940, and changes thereto; TB 226-1, dated 26 March 1942; TB 226-2, dated 25 February 1943; TB 226-3, dated 12 May 1943; TB 226-4, dated 12 May 1943; TB 226-5, dated 20 May 1943; TB 226-6, dated 2 July 1943; TB 226-7, dated 30 June 1943.



# BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

## Section I

### INTRODUCTION

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#### 1. SCOPE.

a. This manual is published for the information of the using arms and services.

b. In addition to a description of the materiel, this manual contains technical information required for the identification, use, and care of the following:

Gun, machine, cal. .50, Browning, M2, water-cooled, flexible

Mount, machine gun, A.A., cal. .50, M2

Mount, pedestal, A.A., machine gun, cal. .50, M2

Mount, machine gun, A.A., cal. .50, M2A1

Mount, pedestal, A.A., machine gun, cal. .50, M2A1

Mount, machine gun, A.A., cal. .50, M3

Chest, ammunition, cal. .50, M2

Chest, water, cal. .50, M3

Set, control equipment, automatic gun, A.A., M1

c. Disassembly, assembly, and such repairs and adjustments as may be handled by using arm personnel may be undertaken only under the supervision of an officer or of the chief mechanic.

d. In all cases where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the unit, the responsible ordnance service should be informed so that trained personnel with suitable tools and equipment may be provided, or proper instructions issued.

e. This manual differs from TM 9-226, Browning Machine Gun, cal. .50, M2, Water-cooled, and Mounts, dated 10 December 1940, as follows:

(1) Description and care of Antiaircraft Machine Gun Mounts M2A1 and M3 have been added, and information covering Mount M2 has been considerably expanded.



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(2) Information on Antiaircraft Machine Gun Tripod Mount M1 has been deleted.

(3) Information on 1-meter base Range Finder M1916 has been removed.

(4) Section on subcaliber equipment has been added.

(5) Section covering operation under unusual conditions has been added.

(6) Section on painting has been added.

## 2. ARRANGEMENT OF MANUAL.

a. As the guns and mounts are separate mechanisms, although operated together when so assembled, they will be treated in separate sections. Mounting and dismounting of the guns with respect to the mounts is covered in the section pertaining to the mount, while disassembly, assembly, and adjustments of the gun and mounts are covered in the sections pertaining to the materiel in question.

## 3. CHARACTERISTICS.

a. **General.** The Browning Machine Gun, cal. .50, M2, Water-cooled, Flexible (figs. 1 and 2) is a recoil operated, belt fed, water-cooled machine gun, similar to other Browning Machine Guns, cal. .50, M2, with the exception of the barrel and water jacket. The gun is furnished with a retracting slide attached to the right side of the receiver. The back plate is of the flexible type with or without spade grips, and the barrel may be either 36 inches or 45 inches in length, although 45 inches is now standard. Both the metallic link disintegrating belt and the fabric belt are used with this gun.

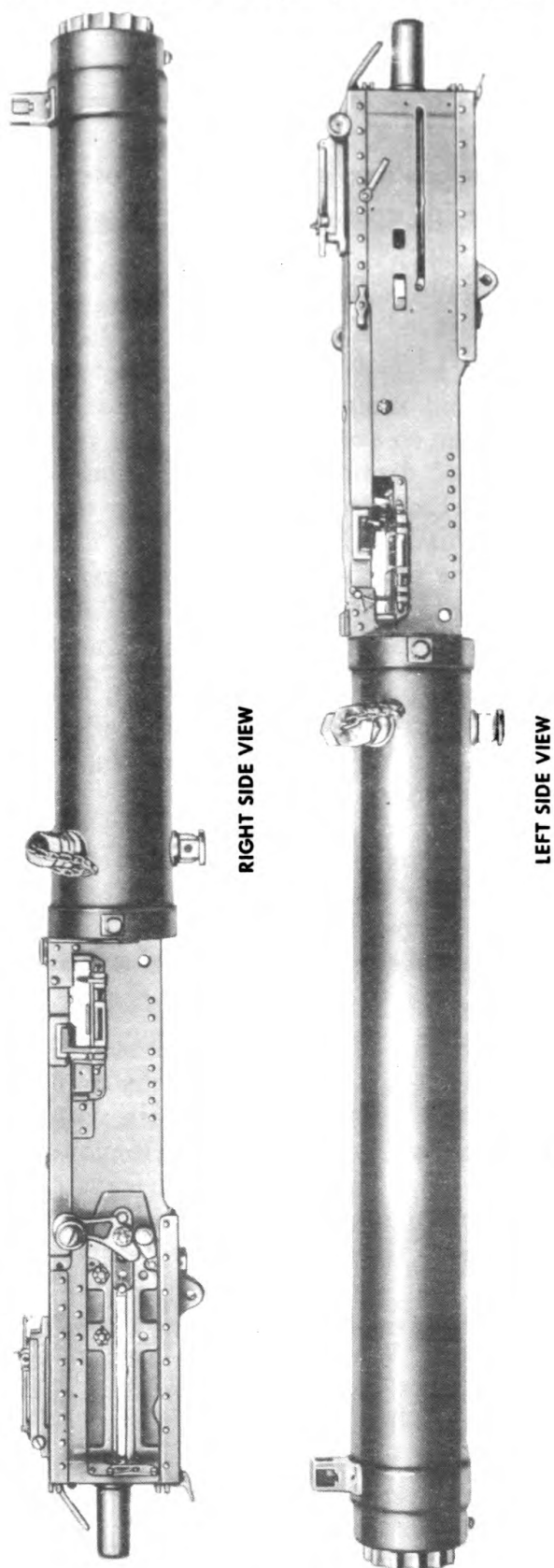
### b. For Use With M2, M2A1, and M3 Antiaircraft Mounts.

(1) For use with the M2, M2A1, and M3 Antiaircraft Mounts covered in this manual (figs. 98 and 106), the gun is assembled with a side plate trigger and a flexible back plate with horizontal buffer and without spade grips (fig. 1). This back plate is equipped with a hand trigger and safety. Normally, the trigger control mechanism of the mount, in conjunction with the side plate trigger, is used to fire the gun; therefore, the hand trigger serves as an additional means of firing the gun should the trigger control mechanism or side plate trigger cease to function. The side plate trigger is carried as a part of the mount. When used with the M39 and M43 Antiaircraft Pedestal Mounts, not covered in this manual, the gun is equipped with a back plate similar to the above but with spade grips, and the side plate trigger is not used (fig. 2).

(2) Should it be necessary to mount a gun having a flexible spade grip back plate on these mounts, the spade grips and handle frames may be removed and a lower filler piece assembled, on which



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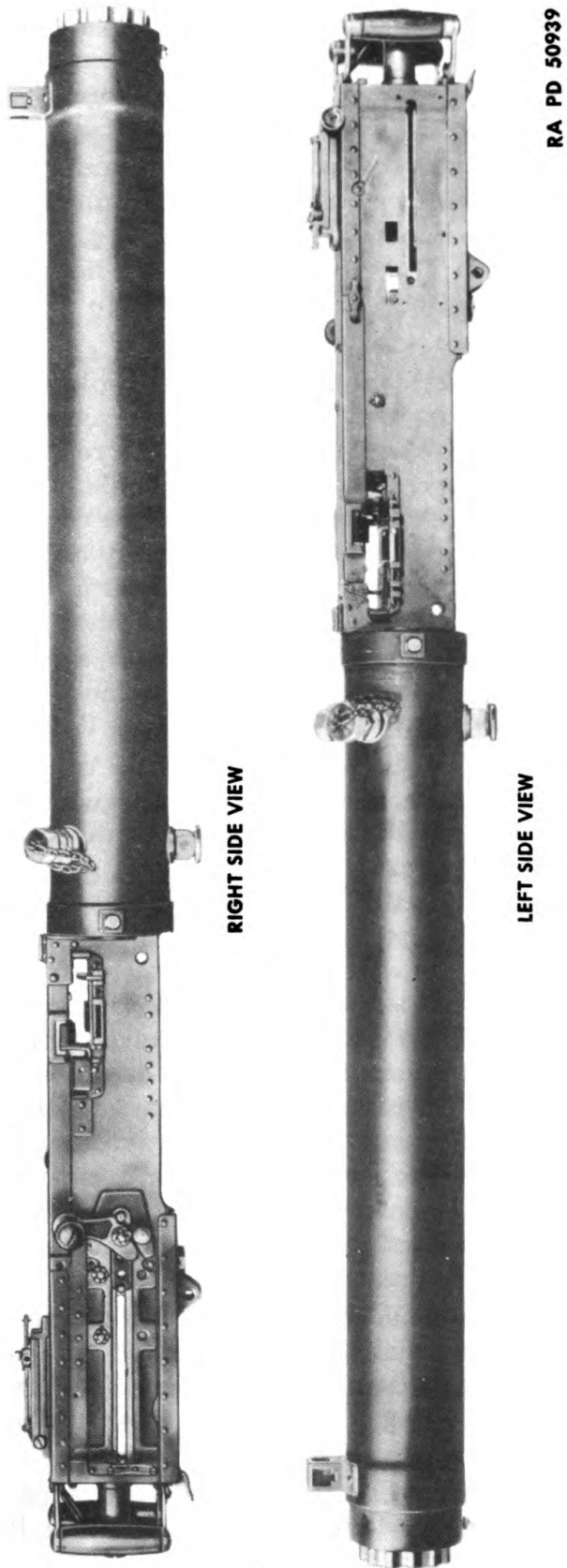


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**Figure 1 — Browning Machine Gun, Cal. .50, M2 — Water-cooled — Flexible — Back Plate Without Spade Grips**



INTRODUCTION



*Figure 2 — Browning Machine Gun, Cal. .50, M2 — Water-cooled — Flexible — Back Plate With Spade Grips*

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the back plate latch and latch lock can be assembled. If this filler piece is not available, or time and/or facilities will not permit the removal of the handle frames and installation of the filler piece, the handle frames may be cut off thereby removing the spade grips, to provide clearance for the gun in the mount.

**NOTE:** A back plate conversion group assembly D35541 is being issued which will make it possible for using arms to convert the fixed back plate or flexible back plate without spade grips to a flexible back plate with spade grips. This group comprises the handle frames, handles, trigger, safety, and component parts to complete the assembly.

**c. Cooling System.**

(1) The cooling system for this water-cooled gun consists of a water jacket surrounding the barrel which is connected by rubber tubing to the water chest. Water is circulated by a rotary pump housed in the water chest and operated by a crank handle. The water jacket of guns with 36-inch barrels holds 8 quarts of water and the 45-inch barrel jacket, 10 quarts. Two types of water chest may be used with this gun; the M2 Chest (early design), a gear-driven gear pump type, or the M3 Chest (later design), a chain-driven rotor pump type. The M2 Water Chest holds approximately 7 gallons of water and the M3 Chest, 8 gallons. Both the water jacket and the water chest should be kept full at all times when in use.

(2) In an emergency, the full water jacket of the gun will permit cooling for short duration. However, for prolonged fire, the water chest should always be coupled to the gun and the entire circulating system kept full of water. The water absorbs the heat generated in firing the gun, and thus prevents the barrel from becoming overheated. The steam tube (early design, 45-inch jackets and 36-inch jackets) is located in the top of the water jacket and is free to slide on the front and rear steam tube supports. Each of these supports is provided with a hole; the rear one being covered by the steam tube when the gun is elevated, and the front one when the gun is depressed, thus preventing escape of water from the jacket. The opposite hole, which is uncovered by this movement, allows the water and any steam generated through prolonged firing, to escape through the steam tube and the outlet leading to the water supply or circulating unit, where any steam is condensed. Thus the supply of water is conserved and visible steam which might disclose a gun position is eliminated.

(3) Guns of recent manufacture with 45-inch barrel are assembled with a water jacket in which the steam tube is fixed in the water jacket and does not slide, and should not be removed. Such water jackets can be identified by the absence of the front steam tube support on the front end cap.

**d. Feeding.** By properly repositioning some of the component parts, the gun may be made to feed from either the left or right side.

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However, when mounted on the mounts covered herein, they must be assembled to feed from the *left* side. A retracting slide is provided which engages the bolt by means of the bolt stud. The retracting slide handle remains stationary and in a forward position while the gun is firing, thus eliminating all moving parts outside the receiver. When mounted on the mounts covered herein, the retracting slide must be assembled to the *right* side of the gun and the side plate trigger on the *left* side.

**e. Mounting.** For antiaircraft purposes, several mounts may be used, five of which are listed in paragraph 1 **b**. Heretofore, this gun has been used with the Antiaircraft Machine Gun Tripod Mount, cal. .50, M1, but use of this mount with this gun has been discontinued. For description of the above listed mounts, refer to sections VII and VIII.

**f. Sights.**

(1) The gun was originally equipped with the conventional machine gun front and combination rear sights. The combination rear sight will eventually be eliminated but as some guns may still be in action with the rear sight assembled, it is covered herein. The front sight is used as a positioning lug for the antiaircraft sights used with the M2A1 and M3 Mounts.

(a) *Front Sight.* The front sight is the conventional blade sight protected by the front sight cover, and affixed to the muzzle end of the water jacket.

(b) *Combination Rear Sight.* The combination rear sight is the conventional leaf-type sight, adjustable for elevation and windage, mounted on the rear of the top plate of the gun, and folding flat when not in use. The windage arc on the base is graduated in mils. The leaf is graduated in yards up to 3,200 yards for cal. .50 M1 ammunition, with a muzzle velocity of 2,400 foot-seconds. Leaves of recent manufacture are graduated for ammunition of 2,660 foot-seconds muzzle velocity. The ammunition for which the leaf is graduated, is usually stamped on the top of the leaf for identification. Calibration, of the sight leaf for ammunition of different muzzle velocities, may be obtained by the use of the elevating screw which raises or lowers the slide 1 mil. By pressing in the half nut, instantaneous adjustment of the slide can be accomplished. The correction for windage is obtained by rotating the movable base by means of the windage screw.

(2) When the gun is mounted on the M2 Mounts covered herein, the above sights, if assembled, are not used. This mount is furnished with a front and rear sight with adjusting mechanism, mounted together on a bracket attached to the mount (figs. 90 and 91) and adjusted by an off-carriage sighting control as described in section VII.

(3) When the gun is mounted on the M2A1 Mounts covered herein, the gun sights, if assembled, are likewise not used. In this case



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a combination A.A. ring-type sight (M1) is mounted to the muzzle end of the water jacket (fig. 92).

(4) When the gun is mounted on the M3 Mount covered herein, the gun sights, if assembled, are likewise not used. In this case a combination ring-type sight, similar to that used with the M2A1 Mount, is mounted to the muzzle end of the water jacket (fig. 117).

**g. M2 Mount** (figs. 80 and 81).

(1) The Antiaircraft M2 Mount covered herein is composed of a pedestal, cradle, and pintle and can be assembled either with three legs or with a pedestal base attached to the lower end of the pedestal. When assembled with three legs, the mount is known as the A.A. Machine Gun Mount, cal. .50, M2, and when assembled with the pedestal base it is known as the A.A. Machine Gun Pedestal Mount, cal. .50, M2.

(2) The cradle in which the gun is mounted is attached to the pintle and the pintle mounted to the pedestal. The legs or pedestal base are mounted to the lower end of the pedestal. The cradle contains an upper and lower recoil, compensating mechanisms, and a trigger control mechanism; a back rest is mounted to the rear end. The sight mechanism, referred to in subparagraph f (2) above, is mounted on a support which in turn is fastened to lugs welded to the side plates of the cradle. An ammunition feed tray and ammunition chest support are fastened to the left side of the cradle, a link chute to the right side. The ammunition chest is mounted to the support, the metallic link bag to the chute. For description of this mount, refer to section VII.

(3) In M2 Mounts of early manufacture, the upper buffer counter-recoil spring adjustment is slightly different from those in mounts of later manufacture and in the M2A1 Mounts. The early type adjustment was obtained by a hexagonal nut threaded to the upper buffer recoil shaft and required great care when disassembling to avoid injury to personnel. This difference will be taken up under description and disassembly. The later type of adjustment is obtained by means of a cylindrical plug threaded into the upper buffer bracket spring housing, and is provided with slots for a spanner wrench.

**h. M2A1 Mount** (figs. 82 and 83). The Antiaircraft M2A1 Mount covered herein is practically identical with the M2 Mount described above, with the exception of the front and rear sight mechanism and support, and right-hand side plate. In this mount the sights mentioned in subparagraph f (3) above are affixed to the water jacket of the gun and the right-hand side plate is without the mounting lugs used for the sight support of the M2 Mount. The ammunition chest and link chute are attached as in subparagraph g (2) above. For description of this mount refer to section VII.

**i. M3 Mount** (figs. 106 and 107).

(1) The Antiaircraft M3 Mount covered herein, is of recent manufacture and will eventually supersede the M2 and M2A1 Mounts.

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This mount is composed of a cradle, a pedestal, and three legs attached to the lower end of the pedestal. A pedestal base may also be attached in place of the legs as in the case of the M2 and M2A1 Mounts, which is used principally for deck or permanent mounting and not covered herein. The lower part of the pedestal is composed of a tubular body on which a tubular socket is mounted and bears and revolves upon a ball bearing. To the upper end of the socket, a forked trunnion bracket is attached to which the cradle is pivoted. The recoil mechanism is mounted within the cradle and to the left side plate of the cradle is the trigger control mechanism. The recoil mechanism is of simpler design than that of the M2 and M2A1 Mounts, and consists of a rear recoil mechanism only, with recoil and counterrecoil buffer springs. The trigger control mechanism is similar to that of the M2 and M2A1 Mounts but is operated differently.

(2) On the rear of the cradle a frame, composed of two irregularly shaped tubular members, is attached for controlling the movement of the cradle. The left-hand member is furnished with three grips pivoted to a movable segment. Three fixed grips are assembled to the right-hand member. The movable segment is linked to the trigger control mechanism slide which operates the side plate trigger on the gun. This construction enables the operator to point and fire the gun while remaining erect, by shifting from one grip to another.

(3) The ring sights are mounted on the water jacket as explained in subparagraph f (3) above, and the ammunition chest and link chute are mounted to the cradle similar to the M2 and M2A1 Mounts. A protection shield plate is fastened to the trigger control frame and an additional overlapping shield is fastened to supports clamped to the trunnion bracket. For description of this mount refer to section VIII.

**j. Equipment.** Equipment for the above mounts consists mainly of the M2 Ammunition Chest and the M2 or M3 Water Chest and hoses described in section XIII. The off-carriage sighting equipment is described in section X. The sighting equipment, which is common to the M2 Mount only, is attached to the sight adjusting mechanism on the mount by means of flexible cables. By means of this mechanism, the sights are adjusted for elevation, lead, and windage, which relieves the gunner of this duty, allowing him to concentrate on covering the target and firing the gun. The use of tracer bullets greatly facilitates the ease of sighting the gun, hence such equipment has virtually become unnecessary. Other equipment, spare parts, and accessories are covered in section XIII.

## 4. DATA.

### a. Machine Gun.

Weight of gun, with water, 36-inch barrel .....	110.00 lb
Weight of gun, with water, 45-inch barrel .....	121.00 lb

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Weight of gun, without water, 36-inch barrel .....	94.00 lb
Weight of gun, without water, 45-inch barrel .....	100.00 lb
Weight of barrel assembly, 36-inch barrel .....	14.50 lb
Weight of barrel assembly, 45-inch barrel .....	17.08 lb
Life of barrel (approx.) .....	5,000 rounds
Over-all length of gun, 36-inch barrel .....	57.00 in.
Over-all length of gun, 45-inch barrel .....	65.93 in.
Number of grooves in barrel .....	8.00
Twist of grooves, 1 turn in .....	15.00 in.
Rate of automatic fire, shots per minute .....	500 to 650

**b. Antiaircraft Machine Gun Mount, Cal. .50, M2.**

	<b>Tripod Type</b>	<b>Pedestal Type</b>
Weight of mount, complete .....	391.50 lb	323.50 lb
Weight of pedestal, with leg clamping ring .....	101.00 lb	101.00 lb
Weight of tripod legs, each .....	40.00 lb	
Weight of pedestal base .....		52.00 lb
Weight of cradle, with pintle and sight support .....	144.00 lb	144.00 lb
Weight of back rest .....	15.00 lb	15.00 lb
Weight of front sight mechanism .....	11.50 lb	11.50 lb
Tripod spread, front to rear .....	77.00 in.	
Tripod spread, right to left .....	90.00 in.	
Height from ground to centerline of gun....	49.00 in.	49.00 in.
Height from ground to line of sight.....	69.50 in.	69.50 in.
Elevation, maximum .....	68.75 deg	68.75 deg
Depression, maximum .....	15.00 deg	15.00 deg
Traverse .....	360.00 deg	360.00 deg

**c. Antiaircraft Machine Gun Mount, Cal. .50, M2A1.**

	<b>Tripod Type</b>	<b>Pedestal Type</b>
Weight of mount complete (approx.) .....	359.50 lb	291.50 lb
Weight of pedestal, with clamping ring.....	101.00 lb	101.00 lb
Weight of tripod legs, each .....	40.00 lb	
Weight of pedestal base .....		52.00 lb
Weight of cradle, with pintle .....	123.50 lb	123.50 lb
Weight of ring sights .....	7.25 lb	7.25 lb
Weight of back rest .....	15.00 lb	15.00 lb
Tripod spread, front to rear .....	77.00 in.	
Tripod spread, right to left .....	90.00 in.	
Height from ground to centerline of gun....	49.00 in.	49.00 in.
Height from ground to line of sight.....	69.50 in.	69.50 in.
Elevation, maximum .....	68.75 deg	68.75 deg
Depression, maximum .....	15.00 deg	15.00 deg
Traverse .....	360.00 deg	360.00 deg



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### d. Antiaircraft Machine Gun Mount, Cal. .50, M3 (Tripod Type).

Weight of tripod mount, complete .....	380.00 lb
Weight of pedestal mount, complete .....	400.75 lb
Weight of pedestal .....	112.00 lb
Weight of tripod legs, each .....	27.00 lb
Weight of cradle, with trunnion bracket .....	120.00 lb
Weight of antiaircraft sight .....	10.00 lb
Weight of pedestal base adapter .....	86.00 lb
Weight of quick acting clamp .....	15.75 lb
Weight of feedway adapter (Navy Mk. VI Ammunition Chest) .....	13.00 lb
Weight of front shield .....	39.00 lb
Weight of rear shield plate .....	18.00 lb
Tripod spread, right to left .....	79.50 in.
Height from ground to centerline of gun .....	36.38 in.
Height from ground to line of sight .....	62.13 in.
Over-all length of gun and mount assembled .....	87.00 in.
Elevation, maximum .....	90.00 deg
Depression, maximum .....	15.00 deg
Traverse .....	360.00 deg

### e. Weight of Water Chest, Ammunition Chest, Ammunition and Sighting Equipment.

Chest, ammunition, cal. .50, M2, empty .....	29.00 lb
Chest, ammunition, cal. .50, M2, loaded .....	89.00 lb
Chest, ammunition, cal. .50, Navy, Mk. VI (empty) .....	12.50 lb
Chest, water, cal. .50 M2, empty, with hose .....	70.00 lb
Chest, water, cal. .50, M2, with water and hose .....	126.00 lb
Hose, assemblies (2) .....	13.50 lb
Chest, water, cal. .50, empty, with hose .....	74.50 lb
Chest, water, cal. .50, M3, with water, and hose .....	139.50 lb
200 links, cal. .50 .....	8 lb
200 cartridges, cal. .50, M2 .....	52 lb

## 5. CAUTIONS.

a. The following cautions are listed at this point for emphasis. These cautions appear in other parts of this manual in the paragraphs indicated. The paragraphs indicated should be carefully read with the cautions in mind.

(1) Before loading the gun, the cradle of the mounts should be firmly clamped in the "0" elevation position, and locked against traversing (M3 Mount) so as not to shift or swing during loading. Control of the mounts in elevation and traversing is explained in sections VII and VIII, and in paragraph 22 (par. 19 b).

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(2) Trigger controls should always be placed at "SAFE" when not engaged in actual firing (par. 21 b).

(3) When using the hand trigger to fire the gun, care should be observed to grip the buffer tube with the four fingers not engaging the trigger, and to allow the elbows to remain free to keep them from being jammed against the back rest when the gun recoils in the mount when firing. This is necessary only in the case of the M2 and M2A1 Mounts, and where flexible back plates are without spade grips (par. 21 b).

(4) The trigger control mechanism should be locked at "SAFE" when the gun is not being fired (par. 21 c).

(5) **CLEANER**, rifle bore, will freeze at temperatures below 32 F. Closed containers should not be filled to more than 75 percent of capacity in freezing temperatures. Completely filled containers will burst when contents freeze (par. 30 c (2) ).

(6) The bore should always be cleaned from the chamber end when possible, to avoid wear at muzzle (par. 30 c (2) (b) ).

(7) Observe care not to displace or damage rear barrel packing while cleaning the bore (par. 30 c (3) (e) ).

(8) Failure to clean the firing pin spring, driving springs, and sear spring, and the tunnels in the bolt in which they operate, may result in gun failure at normal temperatures and will most certainly result in serious malfunctions if guns are operated in low temperature areas, as rust-preventive compound and other foreign matter will cause the lubricating oil to congeal or freeze on the mechanism (par. 34 a).

(9) If it is necessary in an emergency to fire the gun with water in the jacket only and without the circulating system, the inlet (small) union cap must be screwed on the small hose connection bushing, and the outlet hose used as in paragraph 38 b (3). A hot barrel is often indicated by an excessive muzzle blast.

(10) Never release the firing pin while the gage is inserted in the T-slot or the pin will be damaged (par. 46 b (4) ).

(11) Observe care during disassembly, as the oil buffer spring is under high tension (par. 51 e (1) ).

(12) When compressed, the spring is under high tension, and care should be observed to guard against slipping of the parts during assembly to avoid injury to personnel (par. 52 a (8) ).

(13) Be sure the side plate trigger spring is properly seated at both ends, otherwise it will work loose and fly out when the gun is operated, or will jam the trigger. If spring is deformed, replace with new spring (par. 64 a (4) ).

(14) If the springs are removed, care should be taken to avoid injury to personnel as the springs are under high tension (par. 76 e (6) ).

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(15) When adjusting the recoil spring, do not position plug closer to the end of the recoil housing than  $4\frac{7}{8}$  inches (normal setting). This setting prevents a metal-to-metal contact at maximum elevation, and gives full adjustment forward for the spring reserve. The spring has a stress below 60,000 pounds per square inch and should require little if any adjustment. The spring must be cleaned occasionally and, unless plated, must, under normal conditions, be covered with a light grease to prevent corrosion (par. 76 e (7) (a) ).

(16) Be sure the shoulder on the gun securing pins are behind the heads of the gun pin locking screws before turning the handles down (par. 81 c (3) ).

(17) Precautions in firing (par. 96).

(18) Precautions and misfires in firing blank ammunition (par. 97).

(19) In replacing pump in chest, the ten pump body cap screws should be screwed down gradually and evenly to avoid distortion of pump body and consequential misalignment of pump rotor (par. 112 b (1) (c) 4).



# BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

## Section II

### DESCRIPTION AND FUNCTIONING OF THE GUN

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#### 6. GENERAL.

a. The gun, in general, is composed of several groups of parts and assemblies; casing group, cover group, back plate group, barrel and barrel extension group, oil buffer group, bolt group, retracting slide group, and side plate trigger group which is attached to the receiver when used with the mounts covered herein. The retracting slide, cover, combination rear sight, and back plate groups are assembled to the receiver, while the remaining groups are assembled and operate within the receiver. The water jacket, which is a part of the casing group, is assembled to the trunnion block of the receiver.

#### 7. CASING GROUP.

a. This group consists of two main groups; the receiver group, which encloses the recoiling parts, and the water jacket group.

b. The complete receiver consists of two side plates, a bottom plate, top plate, trunnion block, and other parts assembled permanently to them. The trunnion block forms the basic part of the casing. The side plates are attached to the trunnion block and extend rearward; the top and bottom plates are attached to the side plates. The water jacket is threaded to a boss extending from the forward end of the trunnion, block and thread qualification, when assembled, is obtained by the use of brass shims of varying thicknesses. The barrel passes through the trunnion block and the water jacket when assembled, with its rear bearing in the trunnion block, and front bearing in the water jacket. A feedway for the ammunition belt

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is cut in the top of the trunnion block, and a hole bored through side plates and block in the lower front corner furnishes a bearing for the front gun trunnion pin when mounting the gun to the mount. This hole is used for the front gun attaching pin when the gun is mounted to the M3 Mount, as covered in this manual. When mounted to the M2 and M2A1 Mounts, the trunnion studs on the rear end cap of the water jacket are used as explained later. A boss, on the top forward end of the trunnion block, hinges the cover and houses the cover detent pawl assembly; a hardened plug, called the bunter plug, let into the rear face of the block, prevents undue wear at this point due to the striking of the nose of the bullet during loading.

c. The rectangular box formed by the plates contains the working mechanism of the gun. The rear end of this box is closed by the back plate which slides in grooves in the side plates, and the top forward end is closed by the cover group hinged on the trunnion block as described. Brackets are fastened to the top forward end of the side plates in line with the feedway. To these brackets are assembled the rear cartridge stop, link stripper, front cartridge stop, and spring operated belt holding pawl held in position by the belt holding pawl pins. (In guns of recent design, twin belt holding pawl springs are used in place of a single spring.) These parts can be positioned on either side, but when used with the mounts covered in this manual, the cartridge stops and link stripper must be assembled to the right side, and the belt holding pawl to the left side, for *left-hand* feeding. When assembled for left-hand feeding, the rear cartridge stop and link stripper are replaced, when possible, by a right-hand rear cartridge stop assembly. This assembly consists of a rear cartridge stop, link stripper, and cartridge alining pawl, and can be assembled only on the *right* side as further explained in paragraph 8c. Both side plates are slotted for assembly of the retracting slide and side plate trigger assemblies, which must be assembled on opposite sides of the gun. When used with mounts covered herein, the side plate trigger must be assembled to the *left* side, and the retracting slide to the *right* side of the receiver. The switch, which regulates the operation of the extractor in feeding, when the gun is operated, is pivoted to the inner face of the left-hand side plate, and just ahead of it the extractor cam is riveted which raises the extractor at the end of the forward movement. A small hole in the top rear face of this plate furnishes a bearing for the trigger bar pin which extends through the side plate, top plate bracket attached to the top plate, and the trigger bar, when assembled.

d. The bottom plate is fastened to the rear section of the two side plates, an opening being left between the bottom plate and the trunnion block for ejection of the fired cartridge cases. The breech lock cam is fastened to the inner forward end of the bottom plate by means of a

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stud on the cam passing through a hole in the plate, and secured by a bolt and nut. A slight float is allowed the cam when assembled to facilitate alinement with the barrel extension. Cams vary somewhat in design, but are basically the same. On the under side of the plate is a boss, drilled laterally to form a bearing for the rear trunnion (joint, or gun attaching) pin when assembling the gun to the mount.

e. The top plate is fastened to the side plates and covers the upper rear end of the receiver. The top plate bracket is fastened to the under side of the plate, and forms a bearing against which the free end of the cocking lever operates, and also a bearing for the trigger bar pin, upon which the trigger bar is pivoted, as already explained. A bolt latch bracket is attached to the top plate and right-hand side plate, but the bolt latch is not used in this water-cooled gun. The combination rear sight is fastened to the top plate near the rear end. This sight is not used as other antiaircraft sights are attached to the mount (M2) or water jacket of the gun (M2A1 and M3) as explained later. Guns issued in the future will be without this sight.

f. The water jacket (fig. 76) is in the form of a capped cylinder threaded to the forward end of the trunnion block, and locked in position by the spring-operated trunnion block lock housed in the block and seated in a hole in the rear end cap of the jacket. Bosses are formed on the rear end cap of the jacket which act as trunnions for mounting the gun to the M2 and M2A1 Mounts covered herein. When mounted to the M3 Mount the hole in the trunnion block acts as a bearing for the front gun attaching pin as already explained. The rear barrel packing is seated in the rear end of the barrel and held in position by an adjustment ring as explained later (par. 10 a). The front barrel packing is seated in the front barrel bearing located in the front end cap of the water jacket, and held in position and adjusted by the muzzle packing ring and muzzle gland, which is screwed and locked into the front end cap. The steam tube (fig. 76) is seated in the top of the jacket, and slides on the front and rear steam tube supports. The sliding steam tube in water jackets of early manufacture can be removed from the jacket by removing the front steam tube support which is locked in the front end cap by a locking screw. In water jackets of recent manufacture (for 45-inch barrels), the steam tube is mounted rigidly in the jacket and should not be removed. Jackets with this type of tube may be identified by the absence of the front steam tube support in the front end cap of the water jacket.

g. The front sight assembly is attached to the muzzle end of the water jacket, and is used only as a positioning lug for the antiaircraft sights of the M2A1 and M3 Mounts. The intake and outlet hose connections for connecting the hose from the water chest circulating system are located on the top rear end of the jacket. Directly below them is the drain valve for draining the jacket.

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### 8. COVER GROUP (fig. 65).

a. The cover hinges in the trunnion block, pivoting on the cover pin, closes the forward end of the receiver, and carries the belt feeding mechanism. The cover is held open when raised by the cover detent pawl housed in the trunnion block. The cover is latched by the cover latch engaging under the top plate when the cover is closed. The cover extractor cam is riveted to the left inner side of the cover, and acts upon the extractor to depress it against the switch upon the recoil movement of the bolt. The cover extractor spring is assembled to the right of the extractor cam. The forward end (cover down) is secured by a headed stud engaging in a slot in the end of the spring, and the rear end by an undercut in the extractor cam and the cover latch spring which is in turn retained by a headed stud and the cover latch. The cover extractor spring bears upon the extractor causing it to spring into the extractor groove in the head of the cartridge and grip it, when in the feeding position.

b. The belt feed slide carries the belt feed pawl, arm, and spring, and operates in a guideway running transversely in the forward end of the cover. The belt feed pawl is pivoted on the belt feed pawl pin, and is held down to engage the belt by its spring. The belt feed pawl arm, pinned to the pawl, guards against stoppage by preventing engagement of the pawl with the belt on the feeding stroke in case a cartridge still remains in the feedway.

c. The belt feed lever is pivoted at the middle on a stud in the cover, is held in position by a cotter pin, and operates the slide with a lateral movement. A stud formed on the opposite (rear) end of the lever engages in a cam slot cut in the top of the bolt when the cover is latched. The belt feed lever plunger and spring are housed in a hole in the side of the belt feed lever and keep the lever in the correct position when the cover is open, so that when the cover is closed the stud on the rear end of the lever will properly engage the cam slot in the bolt. Two holes take the plunger and its spring, as these parts must be transferred from one hole to the other when changing the direction of the feed. For this gun and mounts, the feed must be from the *left* side, and hence the plunger and spring must be positioned in the hole toward the latch (rear) end of the cover. The cam slot in the bolt is so cut that the forward and backward movement of the bolt cause a side-to-side movement of the lever stud engaged in it. This causes a corresponding oscillation of the forward end of the belt feed lever which is engaged in the recess cut in the rear side of the belt feed slide, with a consequent lateral movement of the belt feed slide. During the feeding of the belt by the pawl action just described, backward slipping of the belt is prevented by the action of the belt holding pawl, previously mentioned in the casing group. Overtravel is prevented by the front cartridge stop and right-hand rear cartridge stop assembly mentioned in the casing



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group. The right-hand rear cartridge stop assembly, assembled to the receiver, consists of an integral link stripper and rear cartridge stop in which is pivoted the cartridge alining pawl actuated by a spring and plunger. The function of the alining pawl is to slip into the extractor groove of the cartridge, alined by the stop element of the assembly, thus preventing the cartridge if short, from being knocked forward when the extractor attempts to grip it for withdrawal. If the cartridge is knocked forward the extractor cannot grip its base to extract it from the belt link and a gun stoppage will result. The function of the link stripper is to hold the link in position while the cartridge is being withdrawn by the extractor. As already stated, the right-hand rear cartridge stop *assembly* is used only when the gun is fed from the left-hand side and is assembled to the right side of the receiver, as is the front cartridge stop, while the belt holding pawl is assembled to the left side. When the gun is assembled for right-hand feeding, the right-hand rear cartridge stop assembly (including the alining pawl) is replaced by a rear cartridge stop and a link stripper (not an assembly) which are assembled to the left side of the receiver as is the front cartridge stop. The belt holding pawl is then assembled to the right side of the receiver. The assembly cannot be used on the left side on account of interference with the extractor. A separate rear cartridge stop and link stripper may, however, be used in place of the assembly, for left-hand feeding, but when available the assembly should be used as it functions better. The detailed function of feeding is described in paragraph 17.

**9. BACK PLATE GROUP (figs. 40 and 41).**

a. The back plate group closes the rear end of the receiver and is held in position by guides on the back plate and corresponding grooves in the side plates of the receiver. The plate is locked in position when assembled to the gun by a latch and latch lock positioned on the bottom of the plate. The back plate has an integral tube extending rearward in which is assembled a buffer plate which protrudes a short distance from the front face of the back plate, and 22 fibre disks held in the tube by a plug type of adjusting screw which in turn is prevented from turning out by a plunger and spring seated in the screw. This screw is for retention and adjustment of the disks and buffer plate, and should be turned in sufficiently to compress the disks tightly against the plate at all times. When so positioned, if the screw extends less than  $\frac{1}{16}$  inch beyond the end of the tube, an additional disk should be placed in the tube to insure compactness of the disk column. The buffer plate and disks receive the impact from the bolt at the end of the recoil movement, which is for the most part taken up by compression of the driving springs as explained later. The face of the buffer plate should extend from the forward face of the back plate approximately  $\frac{3}{16}$  inch when assembled. The buffer plate should not bind in the back plate.

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b. In the upper part of the back plate the trigger is assembled, and below it the safety is secured by screws staked in position. The trigger extends through the back plate and bears upon the under side of the rear end of the trigger bar pivoted in the top plate bracket when assembled. Thus when the trigger is pressed downward, the forward end of the trigger bar is depressed to depress the sear and release the firing pin to fire the gun. When the gun is used with the mounts covered herein, the side plate trigger is used for firing the gun as described in paragraphs 73 and 80, thus the back plate trigger is an auxiliary only. The safety operates laterally when pushed, and blocks or releases the trigger for firing. The safety is positioned by means of a flat spring assembled over it. In back plates of recent design this flat spring is replaced by a coil spring assembled beneath the safety.

c. The spade grip type of flexible back plate used with this gun as in paragraph 3 b (1), is identical with the back plate described above, with the exception of the spade grips. These grips are assembled to an upper and lower bracket which are riveted between flanges on the back plate. The lower bracket takes the place of the lower filler piece and the latch lock is assembled to it instead of to the lower filler piece. A conversion group of parts is available which makes it possible to convert a flexible back plate without the spade grips to one with them (NOTE, par. 3 b (2) ).

d. The spade grip type of flexible back plate cannot be used with this gun when mounted to the above mounts, unless the spade grips and brackets are removed for clearance and a lower filler piece assembled, to which the back plate latch and latch lock are assembled (par. 3 b (2) ).

## 10. BARREL AND BARREL EXTENSION GROUP (figs. 61 and 62).

a. The barrel and barrel extension group consists of two main assemblies; the barrel, and the barrel extension. The barrel (fig. 62) is cylindrical with a taper from breech to muzzle. It is bored with eight grooves with a right-hand twist of one turn in 15 inches. The rear end is threaded to screw into the barrel extension, loosely enough for easy adjustment without shake. Just forward of this thread, a notched ring is threaded onto the barrel for engagement of the barrel locking spring which holds the barrel in adjustment with regard to headspace when assembled to the barrel extension. This ring is locked in position by set screws at manufacture. Just forward of this ring is another threaded ring by which the rear barrel packing, which seats in a groove in the barrel just forward of this ring, is adjusted. By use of special wrenches, the packing can be expanded or relieved, by screwing on or unscrewing the adjusting ring, without removing the barrel from the water jacket.

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The outside diameter of these rings, the packing, and the barrel shoulder act as the rear bearing point of the barrel, which reciprocates in the forward end of the trunnion block, and the front barrel bearing in the front end cap of the water jacket. The front bearing of the barrel is composed of a sleeve attached to the muzzle end of the barrel which bears on the packing positioned in the front barrel bearing in the front end cap. The packing in the rear end of the barrel and in the front bearing prevents the water from leaking out of the water jacket around the barrel. The rear packing is adjusted from the rear when the cover is open, and the front packing by adjustment of the muzzle gland in the front end cap.

b. The barrel extension (fig. 61) is of steel, and extends to the rear of the barrel when screwed to it. Its front end is a formed lug into which the barrel is screwed. Integral side members extend rearward terminating in lugs pointing downward and carrying the breech lock. The rear end is closed by the barrel extension shank pinned in position and extending to the rear to engage with the oil buffer piston rod, when assembled. The bolt is supported by the side walls of the barrel extension and slides in grooves cut for it. These side walls act as tension members to hold the bolt locked against the chamber pressure due to explosion. The barrel locking spring is assembled in an undercut groove in the forward face of the right-hand side member of the barrel extension, and serves to lock the barrel in adjustment with regard to headspace.

c. Locking of the bolt to the barrel extension is effected by the breech lock (fig. 61) which slides vertically in grooves in the rear end of the barrel extension, and is retained by a pin passing laterally through breech lock and elongated holes in the side members of the barrel extension. When pushed upward it engages in a recess in the bottom of the bolt, locking it securely to the barrel extension. The breech lock is operated by the breech lock cam assembled to the bottom plate of the receiver, and cams formed on the breech lock depressors extending from the forward face of the oil buffer body positioned in the rear end of the receiver when assembled. The breech lock cam causes upward locking movement of the breech lock during the forward movement of the barrel extension by direct action against the bottom of the breech lock. The breech lock depressors cam the breech lock down by bearing on the lock pin, on the rearward movement of the barrel extension. This pin extends entirely through the barrel extension where it is allowed up and down movement by the elongated holes in the extension.

d. Recesses cut in the sides of the barrel extension from the rear allow clearance for the breech lock depressors, and guide grooves cut in the lower rear lug allow mating with corresponding guides in the

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breech lock cam fastened to the bottom plate of the receiver. It is this mating that makes necessary a slight float in the cam when assembled in order not to cause binding when the barrel extension reciprocates. It is the guides and grooves which properly position the breech lock cam, barrel extension, breech lock, and bolt with respect to each other and control the recoil of the barrel extension. Various designs of breech lock cams are in use, but basically they are the same. Differences are explained in TM 9-1225.

e. As already stated, the barrel extension shank extends from the rear of the barrel extension. A hook formed on the shank engages with a hook formed on the oil buffer piston rod to hold the two in engagement when assembled. The rear face of this hook on the shank abuts the front face of the piston rod hook. Thus the barrel extension pushes the piston backward in the oil buffer on the rearward (recoil) movement and is pushed forward by it on the forward (counterrecoil) movement due to expansion of the oil buffer spring which is compressed on the rearward movement of the piston. The accelerator, pivoted to the oil buffer body, engages with shoulders on the barrel extension shank to hold it locked to the rear until released by the bolt on its forward movement as explained later.

### 11. OIL BUFFER GROUP (figs. 54, 56, and 59).

a. The oil buffer group is composed of two main groups; the oil buffer body assembly, and the oil buffer assembly with spring and guide. The body is roughly rectangular, bored cylindrically, houses the oil buffer tube group, and is locked in the rear lower end of the receiver, when assembled by a leaf spring staked in the body. Projecting from the front of the body are the two breech lock depressors already mentioned. Just below these depressors, the accelerator is pivoted laterally on a spring positioned pin extending through the body and the accelerator. The accelerator forms two curved hooks which are cam-rotated up behind the barrel extension shank, by the barrel extension on its rearward movement. The tips of these hooks strike a lug extending down from the bolt and kick the bolt to the rear, thus accelerating its movement. The bolt in turn strikes the tips of the accelerator on its forward movement rotating it forward, thus unlocking the barrel extension from the oil buffer body and accelerating its forward movement. A leaf spring positioned in the bottom of the oil buffer body is furnished with a wedge-shaped lug on the rear end. This lug engages in longitudinal tooth notches in the oil buffer tube when assembled in the body, thereby locking it in position and preventing free rotation. An arc on the rear face of the body is marked with a "C" and an "O." This segment corresponds to the toothed segment on the oil buffer tube. An arrow stamped on the rear face of the tube points towards the arc on the body when assembled and is for the purpose of indi-

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cating the proper adjustment of the tube so as to give the proper flow of oil between piston head and valve as explained in paragraph 37.

b. The oil buffer assembly (fig. 59) is in general composed of a hollow cylindrical body, open at one end, which is closed by a threaded cap. A piston is assembled in the tube with a head and valve, and passes through a hole in the cap. The head is threaded to the piston rod, and the valve slides on it between head and nut and is keyed to the inside wall of the tube by two keys on the valve mating with longitudinal keyways in the tube. Thus the piston head and valve can move backward and forward in the tube but when the tube is rotated the valve must rotate with it. This construction allows adjustment of the oil flow through the valve and piston head, due to mating segments in the periphery of the valve and head. Turning of the tube and consequently the valve with it, causes these segments to separate or overlap to increase or decrease flow of oil through the valve and head. Longitudinal movement of the valve on the piston rod uncovers additional openings in the head, on the counterrecoil movement of the piston as explained in paragraphs 17 b (2) and (3) and 37.

c. The piston rod, as already explained, is mated with the barrel extension shank and thus cannot turn. Turning is further prevented by a key on the spring guide, locked to the rod, engaging in a slot in oil buffer body when assembled. The valve is assembled loosely on the rod to the rear of the piston head; thus when the rod and head to which it is threaded are pushed to the rear by the barrel extension, the head and valve are pressed together by the resisting force of the oil. When the piston rod is pushed forward by the piston spring (assembled to the rod as explained below) which it has been compressing on the rearward movement, the valve and head separate slightly, the separation being limited by the piston head nut which retains the valve on the piston rod.

d. The oil buffer spring is assembled on the piston rod, outside the tube, bears on the tube cap, and is held in position under compression, by the oil buffer spring guide. This guide is in the form of a washer, held in place by a cross pin passing through and extending from the forward end of the piston rod, and bearing in notches in the guide when assembled. Oil is prevented from leaking around the piston rod by packing held in place by the packing gland plug. Two filler holes in the rear end of the buffer tube permit filling and escape of trapped air while filling. Adjustment of the oil flow between piston head and valve is obtained by turning the tube clockwise or counterclockwise by inserting a screwdriver or similar tool through a hole in the back plate and into a slot in the rear end of the tube as explained later (par. 37). The rear end of the tube has flattened sides to facilitate disassembly.

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### 12. BOLT GROUP (fig. 51).

a. The bolt is the main working group of the gun. All functions of operation, except feeding of the belt, are performed directly by its parts and even this is done indirectly through the belt feed lever as previously described in the cover group.

b. The bolt is a steel block roughly rectangular in shape, carrying the firing and chamber feeding mechanisms. It has a longitudinal reciprocating movement parallel to the axis of the gun. It is supported in the barrel extension by engagement of its guides in corresponding grooves and can move only in the direction of these grooves.

c. Two cam slots cut in the top of the bolt take the stud on the belt feed lever. One is used for a right-hand feeding movement and one for a left-hand feeding movement and so marked by an "R" and "L" stamped near the proper groove. The cam slots are shaped so that the backward and forward movement of the bolt causes a side-to-side movement of the belt feed lever stud engaged in it, and hence a like movement of the slide in the cover which is engaged with the other end of the lever. The bolt switch seats in the top of the bolt and is traversed by a single groove. The switch can be assembled to suit either left- or right-hand feeding by turning it so that its groove coincides with the desired groove in the bolt. It is held in this position by a stud which seats in the bolt and switch. When assembled for left-hand feeding, the narrow end of the switch faces to the rear.

d. Extraction of cartridges from the belt, and feeding to the chamber is done by the extractor, which is an L-shaped piece horizontally pivoted in the left side of the bolt near its front end. It has a claw on its free end for extraction of the cartridge from the belt and a hook, called the ejector, which grips the body of the live cartridge, helps guide it into the chamber by way of the T-slot, and aids ejection of the fired casing through the opening in the bottom of the receiver after extraction from the chamber by means of the T-slot in the bolt. The pivot shank of the extractor also secures the bolt switch in its seat in the top of the bolt. A stop pin in the forward left face of the bolt limits the downward movement of the extractor. The operation of the extractor is definitely controlled so as to follow a complete cycle during the recoil and counterrecoil of the bolt, by action of the spring-operated switch (not the bolt switch) pivoted on the left side plate of the receiver, and the extractor cam, in conjunction with the cover extractor cam and cover extractor spring positioned in the cover. In the front end of the bolt a T-slot is cut into which the base of the cartridge is pushed by the extractor after extraction from the belt. The rear face of the T-slot bearing upon the base of the cartridge pushes it into the chamber of the barrel and holds it there against the stop shoulder of the chamber until fired. The bolt then pulls the fired cartridge case



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from the chamber through the medium of the T-slot from which it is ejected as the next live cartridge is inserted.

e. The bolt is drilled transversely, about midway, for the shank of the bolt stud. This stud is common to the retracting slide only, which permits retraction of the recoiling parts by hand. The stud is secured during operation by a collar formed on the stud which seats inside the side plate. The diameter of this collar is larger than the width of the slot in the side plate, except in the center where the slot is enlarged for the collar to enter, when assembling and disassembling.

f. The bolt is drilled longitudinally its entire length and counter-bored nearly to the front end at its upper right corner to provide a housing and seat for the driving spring rod and two concentric driving springs which are assembled as a unit. (Early type guns had a single driving spring. The double spring assists the functioning of the gun at high-angle fire.) The driving spring rod is free to pass entirely through the bolt, but the springs which are assembled one inside the other on the rod, are seated near the front of the bolt by the driving spring rod collar which retains the driving springs on the rod, and seats on the shoulder of the counterbore. The collar is retained by a cross pin in the rod. On the rear end of the rod is the rod head, in which is assembled a pin which seats in an elongated slot in the rear of the right-hand side plate. This slot serves to retain the driving spring rod assembly when the back plate group is removed; when the back plate group is assembled, the rear end of the driving spring rod assembly bears against the front face of the back plate.

g. The bolt contains the entire firing mechanism, consisting of the firing pin and the firing pin extension assembly, the cocking lever and the cocking lever pin, the sear and sear spring, the sear slide and the sear stop assembly. The firing pin is cylindrical with a tapered nose and a collar on the rear end which seats in a groove in the forward end of the firing pin extension to lock the two together when assembled. This pin operates in a longitudinal tunnel in the bolt, the nose of the pin extending through the face of the bolt when in the fired position. The firing pin extension is tubular and houses the firing pin spring retained, under tension, at the rear by the solid end of the extension and at the front by a stop pin passing through the extension. The extension is slotted vertically near the rear to allow insertion of the sear stop pin which runs vertically through bolt and extension and acts as a compression stop for the spring when assembled. (The flat rear end of the stop retains the sear in the bolt.) The slot in the extension extends to the rear to allow engagement and operation of the lower end of the cocking lever. The rear end is cut laterally to form a hook-shaped notch facing downward. This notch engages with a hook on the sear facing upward. The engagement of this hook and notch holds

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the firing pin extension and consequently the firing pin in the retracted position when cocked, under tension of the firing pin spring which bears upon the sear stop pin as explained, and the sear spring.

h. The cocking lever retracts the firing pin after firing by levering the firing pin extension to the rear, cocks the firing mechanism, and prevents premature firing. It is pivoted on a transverse pin in the bolt called the cocking lever pin, and oscillates on this pin during recoil and counterrecoil of the bolt by action of its free (upper) end against the guide surfaces of the top plate bracket. The cocking lever pin varies somewhat in design, and must in all cases be assembled to the *left* side of the bolt for proper functioning. During recoil of the bolt, the lower end of the cocking lever rotates backward, thus retracting and cocking the firing pin group. During counterrecoil of the bolt, the lever rotates forward thus freeing the firing pin extension which is held in its rear, cocked position by the sear. Complete freedom of movement of the extension is not attained, however, until the bolt has reached the locked position, and thus premature firing is prevented.

i. The sear is a vertically sliding member which operates in guide slots cut for it in the rear of the bolt. The sear is secured by the sear stop pin assembly, the flat end of which is rotated into a slot in the bolt and over the sear when assembled. The hook formed on the forward face of the sear faces up and engages with the hooked notch in the firing pin extension, when in the cocked position, which faces down when assembled. A coil spring seated below the sear engages the two parts, and helps to hold them in engagement in conjunction with the firing pin spring. The sear slide is a flat piece which moves laterally in a groove in the rear of the bolt. A notch in the lower face of the slide mates with a triangular lug on the rear face of the sear when assembled, and in the cocked position. If the slide is moved to right or left, the sear will be cammed downward, and disengagement of the sear and firing pin extensor will take place thus freeing the firing pin extension and firing pin to which it is attached, to spring forward and strike the primer of the cartridge to fire the gun. This action takes place when the side plate trigger is used to fire the gun, as explained later in paragraph 14. If the hand trigger and trigger bar are used, the forward end of the trigger bar will press downward on the top of the sear upon which it bears (with bolt forward) when the rear end is raised by the downward pressure on the trigger, and the firing pin extension will be released. As the notch in the sear slide is not centrally located, the long square end must be pointed toward the side plate trigger when the slide is assembled to the bolt.

j. A transverse notch in the bottom of the bolt near its rear end provides a locking surface against which the breech lock acts; this surface is the forward side of this notch, and is inclined at an angle of about 14 degrees. The breech lock is beveled to agree with this

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cut to provide quick release of the lock and to prevent sticking. The front upper front edge of the lock is slightly beveled to ease the final disengagement of the lock and thus relieve a sudden strain on the base of the cartridge during the initial movement of extraction, which might result in a ruptured cartridge casing. The angle of these faces also assists the unlocking through the pressure exerted by the bolt. To the rear of the locking surface, a lug is formed on the bottom of the bolt. This lug is acted upon by and acts upon the accelerator, as described in the oil buffer group (par. 11).

**13. RETRACTING SLIDE GROUP (fig. 77).**

a. The retracting slide group provides for the retraction of the recoiling parts by hand and is used for loading, unloading, and reduction of stoppages in firing. The slide mechanism can be assembled to either side of the receiver irrespective of the direction of feeding, but must be assembled to the side opposite the side plate trigger. When used with the gun and mounts covered herein, it must be assembled to the right side of the gun, as the side plate trigger must be assembled to the left side to function with the trigger control mechanisms of the mounts.

b. The retracting slide is a rectangular horizontally sliding member which slides in grooves in the inner side of the retracting slide bracket, when the bracket is fastened to the side plate of the gun. The bracket is attached at front and rear by screws threading into bosses on the side plate. Two bolt clamps, located in the top of the bracket, clamp it firmly to the side plate and prevent any possible forward or rearward movement of the bracket when pressure is applied to the retracting slide handle lever.

c. The retracting slide lever stud is threaded into the slide, extends through a longitudinal slot in the bracket, and to it is fastened the retracting slide lever. To the upper end of this lever the retracting slide grip is bolted and from the lower end a lug extends downward. This lug bears upon a stud threaded into the lower part of the bracket, and forms a fulcrum for the lever when the handle is pulled to the rear. This arrangement supplies leverage at the beginning of the backward pull, to the point at which the bolt is unlocked from the barrel extension and the extension is locked to the oil buffer. From this point on, the pull is against the compression of the driving springs only, as against that of the driving and oil buffer springs and oil resistance at the beginning of the movement.

d. The bolt stud is seated in the bolt when assembled as already explained in paragraph 12 e, and engages with the rear face of the retracting slide when the slide is pulled to the rear, otherwise it moves longitudinally with the bolt, independent of the slide.

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e. When operated, the slide is pulled to the rear by the handle, thus pulling the bolt, barrel, and barrel extension group with it. When fully retracted and released, the handle springs forward with the bolt, propelled by the driving springs through the medium of the bolt stud. At the end of the forward movement, it comes to rest and is held in position by a spring plunger assembled in the top of the bracket and seating in a notch in the slide. The slide remains thus while the gun is firing, as the bolt stud moves independently with the bolt. Thus, there are no moving parts outside of the gun while it is firing.

### 14. SIDE PLATE TRIGGER GROUP (fig. 78).

a. The side plate trigger can be assembled to either side of the receiver of the gun and is the means by which the gun is fired when assembled to the mounts covered herein. When used with these mounts, it must be assembled on the left side of the gun. Likewise, the sear slide in the bolt must be so assembled that the square end is towards the left side of the bolt, in order to contact the side plate trigger to fire the gun.

b. The side plate trigger mechanism is composed of the side plate trigger cam pivoted in a longitudinal slot in the housing. Between the cam and a bridge on the housing, a small coil spring is seated, which supplies spring action to the cam. A wedge-shaped lug on the free end of the cam passes through the housing, which projects through a slot in the side plate of the gun to contact and operate the square end of the sear slide in the bolt when firing. The cam is depressed into the receiver against the sear slide by the side plate trigger slide which moves longitudinally in guideways on the outer side of the housing. A notch is cut in the slide with the forward face perpendicular. A similarly shaped lug, on the trigger control mechanism slide on the mount, mates with this notch when assembled, and is the means by which the side plate trigger is operated.

c. As the slide is forced to the rear, it forces the cam inward towards the sear slide in the bolt, and the lug on the cam is thus forced into contact with the sear slide. As the slide is forced forward, the pressure on the cam is relieved and the cam is returned to its original position inside the housing by the action of the coil spring afore-mentioned.

d. After the initial depression of the side plate trigger cam, through manual operation of the trigger control mechanism on the mount, to fire the first shot, the side plate trigger is operated automatically as the gun recoils and counterrecoils, as the trigger slide is continually in partial engagement with the trigger control mechanism on the mount. As the gun moves to the rear in the mount, the side plate trigger slide is forced forward and the cam is disengaged from the sear slide. As the gun moves forward, the slide is forced to the rear and the cam is forced inward to cam the sear slide to release the sear and thus fire the

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

gun. These movements are so timed by the construction and adjustment of the side plate trigger on the gun and the trigger control mechanism on the mount, that the sear slide is forced inward to depress the sear and hence release the firing pin when the gun in the mount and the bolt in the gun, reach the proper position to fire. Detailed functioning of the gun is given in paragraph 17.

**15. COMBINATION REAR SIGHT (fig. 71).**

a. The combination rear sight is attached by screws to the top plate of the gun, but, as afore-stated, is not used when the gun is mounted to the mounts covered herein. In guns of recent issue this sight is not furnished, although the front sight mounted on the water jacket is still furnished as a means of positioning the antiaircraft sights used on the M2A1 and M3 Mounts. The combination rear sight will be eliminated from all guns in the future and replaced with a flat plate screwed to the top plate.

b. This sight is composed of a fixed base screwed to the top plate. Upon this fixed base a movable base is pivoted at the center to allow rotation about the pivot stud. A rectangular leaf is hinged at one end to the rear of the movable base to allow the leaf to be folded down flat when not in use, and upon it the slide moves for adjustment. A long threaded rod called the elevating screw is assembled to the right side of the leaf, and passes through the slide engaging with a threaded lug on the slide cap assembled to the slide. When the screw is turned the slide is moved up and down in grooves in the leaf. A half nut assembled to the slide permits instantaneous adjustment. When the nut is pulled out, it disengages the threads in the slide from the elevating screw, and thus allows the slide to be pushed up or down freely. When released, engagement is again obtained by spring action of the nut, and the slide is anchored and can be locked in position by turning the nut.

c. A drift slide is assembled in the slide which moves up and down with it, and in this drift are cut two peep holes for sight alinement. The drift slide moves in grooves cut at an angle to the axis of the leaf and running towards the left top side of the leaf. Thus the drift slide moves slightly to the left as it moves upward and towards the perpendicular axis of the leaf when moved downward. This left-hand movement is furnished to offset the "drift" of the bullet to the right due to its "spin" caused by the turn of the grooves in the bore of the barrel. The drift increases with the distance the bullet travels; thus as elevation is raised to offset the pull of gravity on the bullet, the compensation for drift must be increased, as the distance between the line of flight of the bullet and the bore line will become greater the farther the bullet gets from the muzzle of the barrel. The use of tracer bullets obviates to a great extent the necessity for a sight of this character.

d. The object of the movable base is to offset the drift of the bullet

## DESCRIPTION AND FUNCTIONING OF THE GUN

when acted upon by *wind*. This base is furnished with teeth cut in its rear arc which mesh with the threads of the windage screw passing transversely through a hole in the rear end of the fixed base. By turning this screw the movable base is rotated clockwise or counterclockwise, and as the leaf is mounted off center it is swung to right or left to compensate for the effect of the prevailing wind upon the bullet. This windage drift is a separate factor from the drift of the bullet due to its spin as explained. A U-shaped spring assembled on a stud in the fixed base, and a coil spring assembled to the windage screw collar, furnish spring tension between the movable base and the windage screw.

e. The graduations for elevation and windage adjustments are etched on the rear face of the leaf and the fixed base respectively.

## 16. GENERAL FUNCTIONING OF THE GUN.

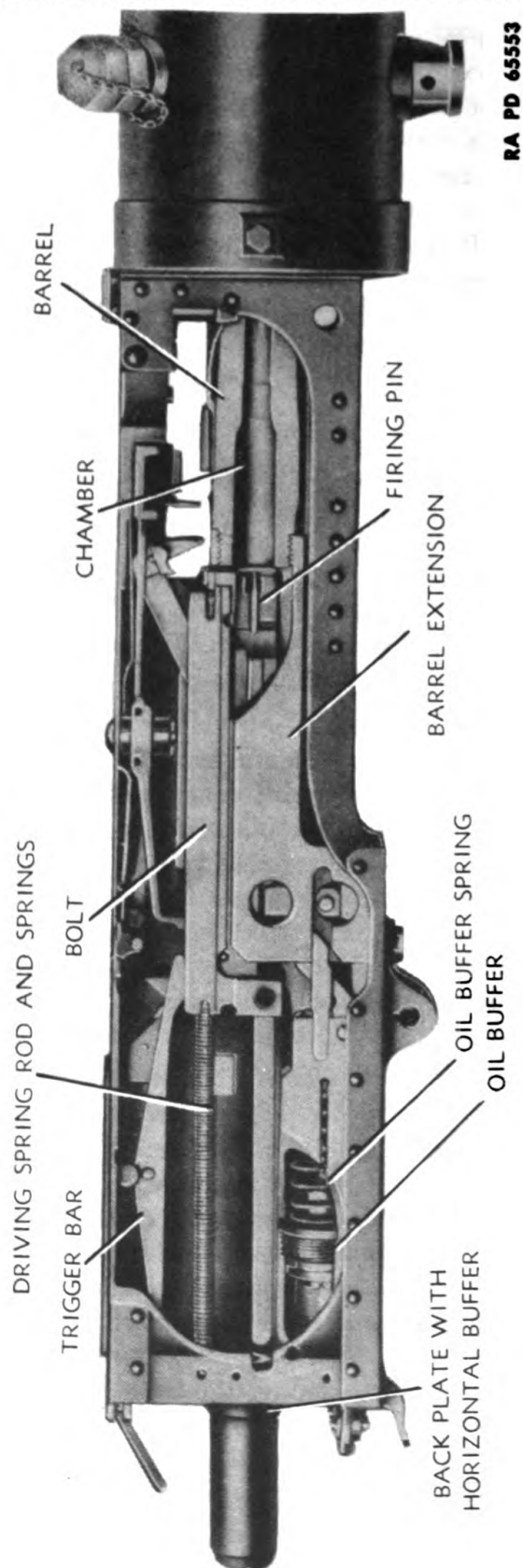
a. Although the Browning Machine Gun M2, Water-cooled, is basically an automatic weapon, it is necessary to load and cock it manually to start the functioning sequence. The following descriptions of general and detailed functioning assumes this to have been done as outlined in the operation of the gun contained in section III.

b. While the gun is essentially automatic in function, when fired by the hand trigger, it is in reality a semiautomatic gun when fired in the mounts covered in this manual. This is due to the fact that the trigger control mechanisms assembled on the mounts operate the side plate trigger, assembled to the gun, on the counterrecoil of the gun in the mount. But as this trigger control mechanism can be positioned so as to operate the side plate trigger each time on the counterrecoil movement, the gun is still fired automatically. The function of the gun proper, as set forth in this description, is therefore influenced to some extent by the mount. Relation between gun and mount is covered more fully in the sections covering the mounts.

c. The mechanical functioning of the gun is started by releasing the firing pin which springs forward to detonate the primer and fire the cartridge positioned in the chamber of the barrel. The firing pin is released by disengagement of the sear from the firing pin extension to which it is attached, either by means of a hand trigger or side plate trigger as already explained. When a cartridge is fired, the burning powder ignited by the primer rapidly generates gas. Since the gas is confined by the cartridge case and the bullet, it builds up a high pressure. This pressure, which exceeds 50,000 pounds per square inch at its maximum, and is exerted in all directions. However, as the bullet presents the least resistance it is driven out of the cartridge case and out of the barrel. As the pressure is exerted in all directions, it attempts to drive the cartridge case to the rear, out of the chamber. This is, how-

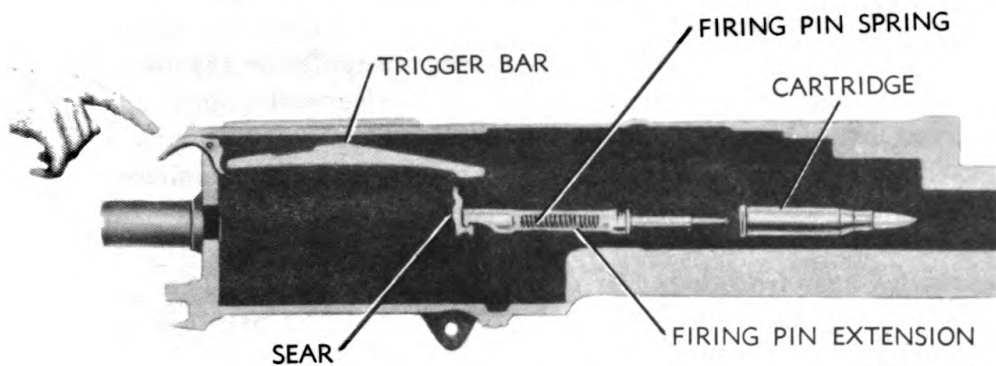


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**Figure 3 — Cutaway View of Gun**

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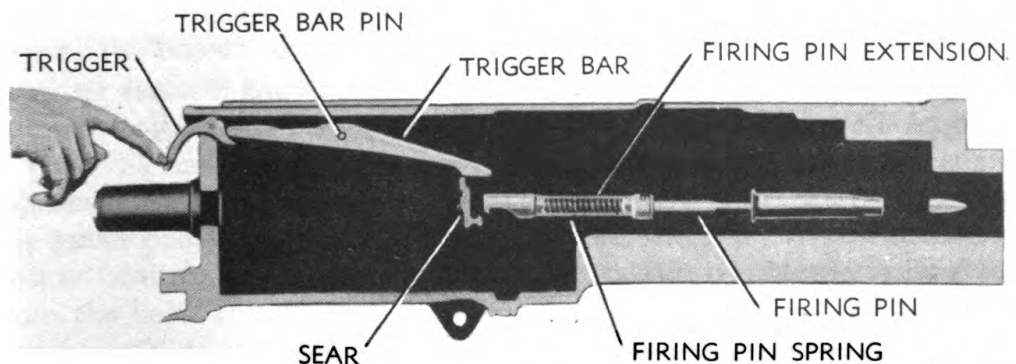


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**Figure 4 — Ready to Fire Position**

ever, prevented by the bolt which is locked to the barrel extension threaded to the rear end of the barrel, as well as the friction of the cartridge case with the walls of the chamber against which it has been expanded. However, as the barrel extension and barrel can move to the rear as a unit, they are driven rearward by the bolt upon which pressure is exerted. (The friction of the case in the chamber prevents all the remaining force from acting on the bolt, thus the necessity of keeping chamber and ammunition free from oil and grease.)

d. As the bullet travels out of the barrel, the force of recoil carries the barrel, barrel extension, and bolt group backward approximately  $1\frac{1}{8}$  inches. During this movement, the bolt is unlocked from the barrel and barrel extension. The rearward travel of the barrel and barrel extension is stopped by the oil buffer assembly and the barrel extension held to the rear by the action of the accelerator on the barrel extension shank. The bolt assembly continues its rearward travel for an additional 6 inches until it is stopped by the compression force of the driving springs and the back plate. During this rearward motion, the bolt withdraws the empty cartridge case from the chamber, and also extracts a second live cartridge from the supply belt through the medium of the extractor.



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**Figure 5 — Firing Position**

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

e. The bolt assembly is driven forward by the driving springs, and during this forward motion, the empty cartridge is ejected from the bottom of the gun. At the same time, the second (live) cartridge is started into the barrel chamber. The oil buffer spring shoves the barrel extension and barrel forward when the latter has been released by the bolt acting upon the accelerator. During this movement, the bolt is again locked to the barrel extension and barrel so as to prevent the cartridge case from being driven rearward after firing. If trigger action has been maintained, the firing pin is released just before this recoiling group reaches its foremost (battery) position. This fires the second cartridge and another cycle is started. This cycle is repeated automatically as long as trigger action is maintained and as long as ammunition is supplied.

**17. DETAILED FUNCTIONING OF THE PARTS OF THE GUN (fig. 3).**

a. In the following exposition a gun employing a hand trigger is used. Except for the actual manner in which the sear is depressed, whether by a hand trigger and trigger bar, or by a side plate trigger in combination with the sear slide, the functional operation of the gun is identical.

b. Each time a cartridge is fired, the mechanical action within the gun involves many parts moving simultaneously or in their proper order. The action of these parts and their relationship to each other can be explained more clearly if the action is separated into various phases. These phases will be explained in the following order:

- |                      |                             |
|----------------------|-----------------------------|
| (1) FIRING.          | (5) AUTOMATIC FIRING        |
| (2) RECOILING        | (6) FEEDING                 |
| (3) COUNTERRECOILING | (7) EXTRACTING AND EJECTING |
| (4) COCKING          |                             |

**(1) FIRING.**

(a) When the gun has been loaded and the firing pin has been cocked by hand, the firing mechanism is in the position shown in figure 4.

(b) When the hand trigger is pressed downward it raises the rear end of the trigger bar. The trigger bar pivots on the trigger bar pin, causing the front end to press down on the top of the sear. The sear is forced down until the hook on the sear is disengaged from the shoulder of the notch in the firing pin extension. The firing pin and firing pin extension are driven forward by the firing pin spring to fire the cartridge (fig. 5).

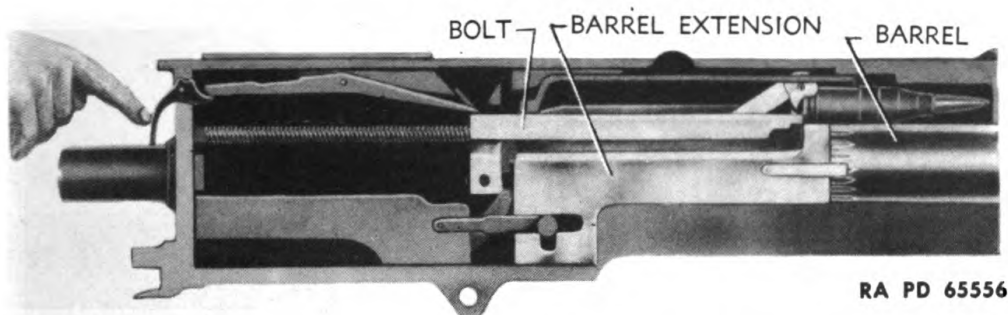
(c) When the side plate trigger cam is pressed inward, it moves the sear slide to the right in its guideway. The sear slide cams the sear downward by means of the left-hand sloping face of the notch in the

## DESCRIPTION AND FUNCTIONING OF THE GUN

slide bearing on the corresponding sloping face of the sear lug with which it is engaged. The sear is forced down until the hook on the sear is disengaged from the shoulder of the notch in the firing pin extension. The firing pin extension and firing pin are driven forward by the firing pin spring to fire the cartridge.

### (2) RECOILING.

(a) The complete cycle of the recoiling portion of the gun, which takes place as each cartridge is fired, consists of the recoil movement, when certain parts of the gun move rearward, and the counterrecoil movement when these same parts move forward. At the instant of firing, the barrel, barrel extension, and bolt, known as the recoiling group or recoiling parts, are in the forward position in the gun, as shown in figure 6.



**Figure 6 — Recoiling Parts in Forward Position**

(b) At this time, the bolt is held securely against the base of the cartridge by the breech lock, which extends up from the barrel extension into a notch in the under side of the bolt (A, fig. 7).

(c) After the cartridge explodes and as the bullet travels out of the barrel, the force of recoil drives the recoiling group rearward. During the first  $\frac{3}{4}$  inch of travel, the breech lock is pushed back off the breech lock cam step. This permits the breech lock to be forced down out of the notch in the bolt by the breech lock depressors engaging the breech lock pin assisted by the action of the bolt upon the beveled surface of the lock. This unlocks the bolt from the barrel extension. B, figure 7 shows the unlocking action taking place.

(d) As the recoiling group moves toward the rear, the barrel extension rolls the accelerator rearward. The tip of the accelerator strikes the lower projection on the bolt and accelerates the movement of the bolt to the rear. In figure 8 the breech lock is completely unlocked from the bolt.

(e) The barrel and barrel extension have a total rearward travel of approximately  $1\frac{1}{8}$  inches at which time they are completely stopped by the oil buffer group (fig. 9).

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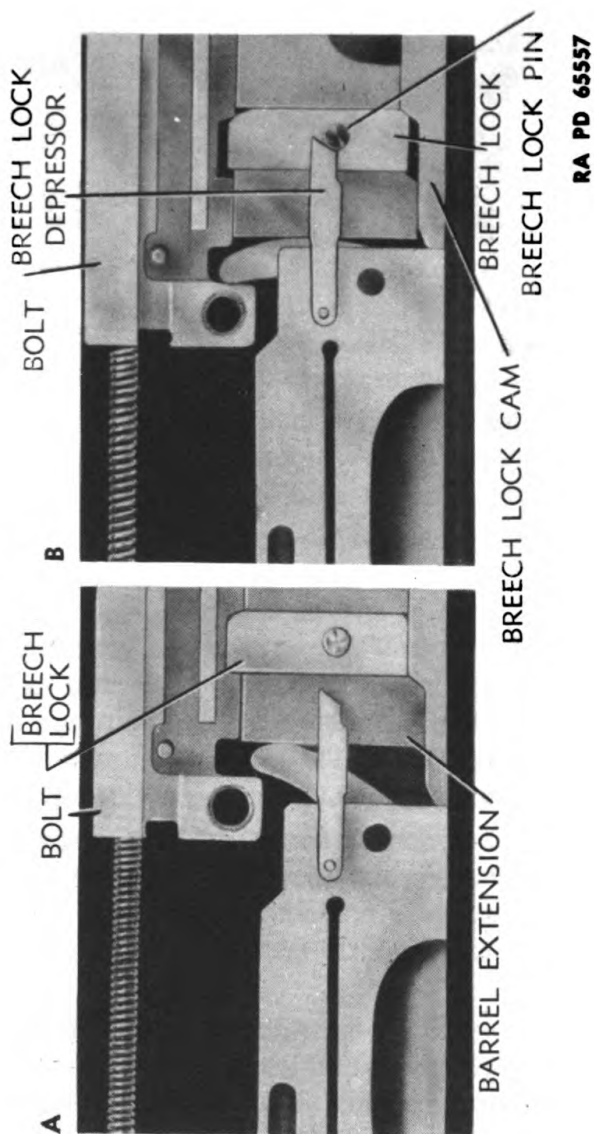


Figure 7 — Breech Lock Locked "A" and Unlocking "B"

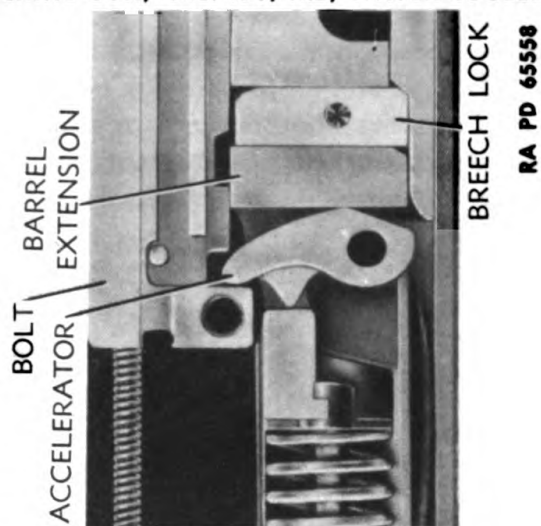
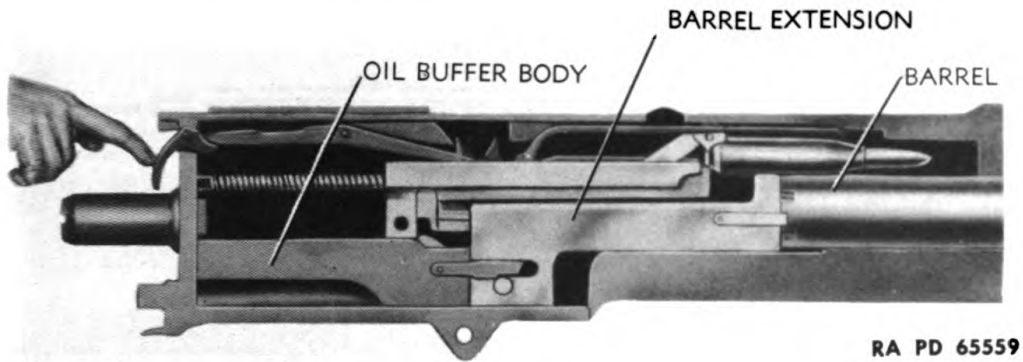
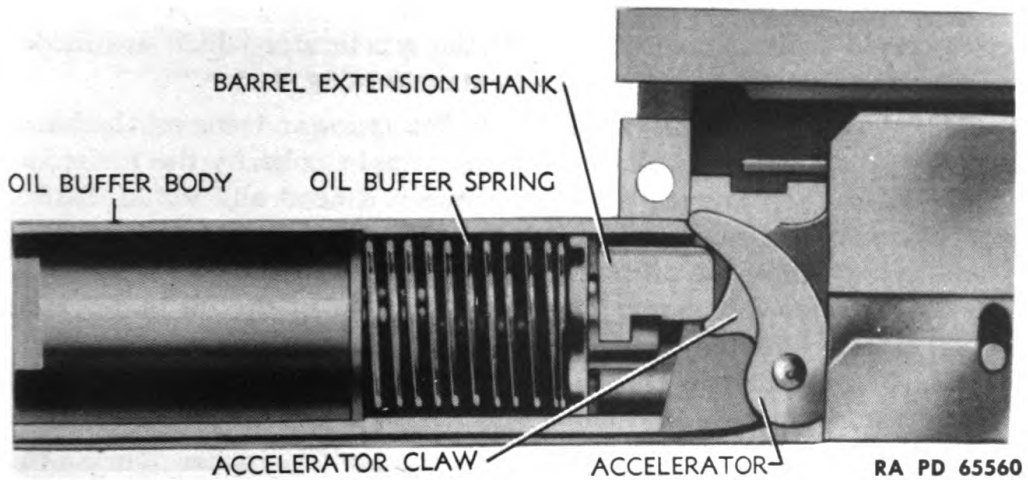


Figure 8 — Breech Lock Unlocked

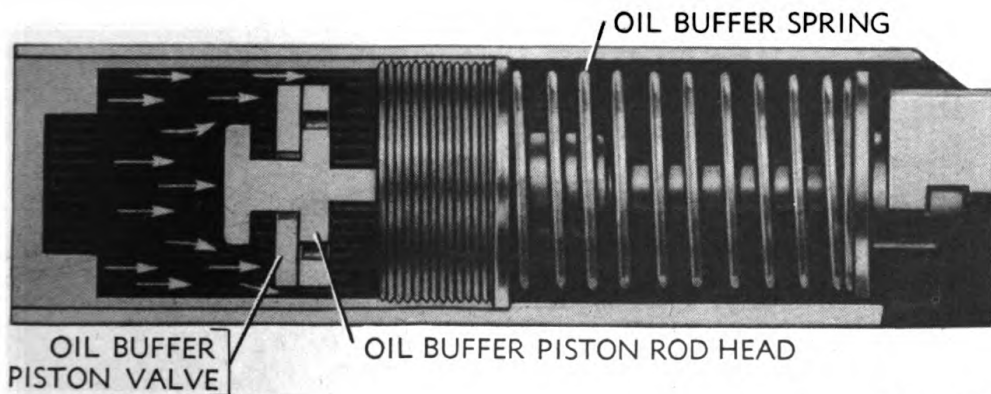
## DESCRIPTION AND FUNCTIONING OF THE GUN



**Figure 9 — Recoiling of Barrel and Barrel Extension**



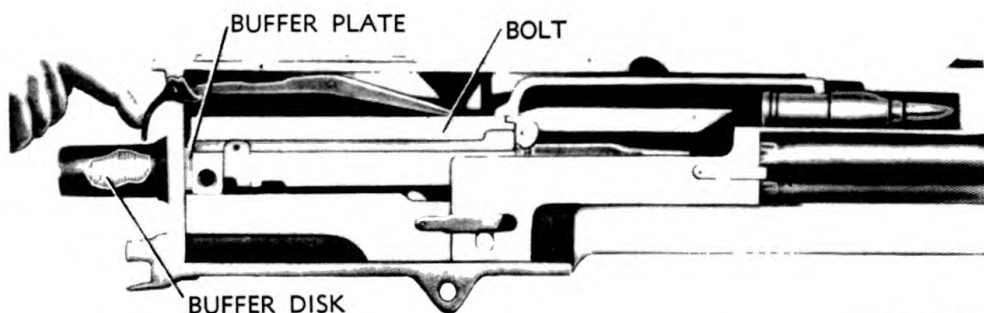
**Figure 10 — Oil Buffer Spring Compressed and Barrel Extension Locked Back by Accelerator**



**Figure 11 — Action of Oil Buffer During Recoil Movement**



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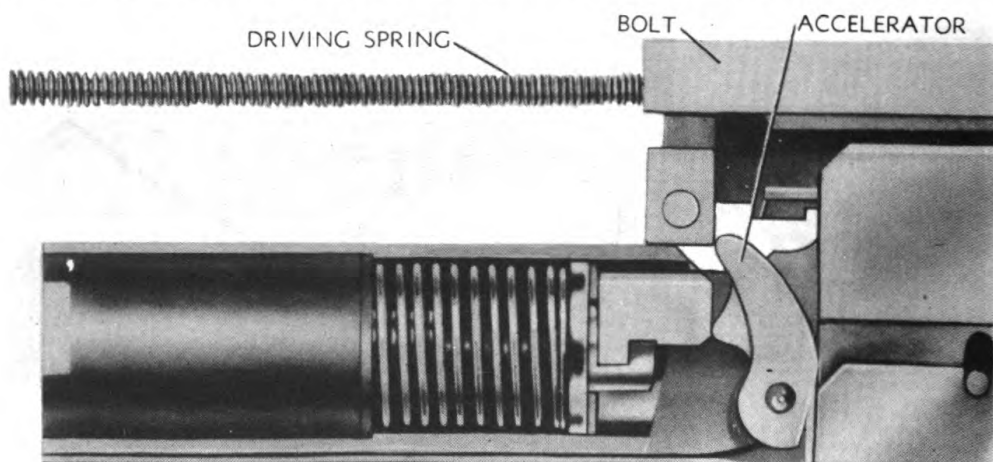
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**Figure 12 — Recoil Movement Completed**

(f) During this recoil of  $1\frac{1}{8}$  inches, the oil buffer spring is compressed by the barrel extension shank. The spring is locked in the compressed position by the claws of the accelerator which are moved against the shoulders of the barrel extension (fig. 10).

(g) The oil buffer assists the oil buffer spring in bringing the barrel and barrel extension to rest during the recoil stroke by the resistance of the oil to the movement of the piston rod head and valve. During the  $1\frac{1}{8}$  inches of rearward travel, the piston rod head is forced from the forward end of the oil buffer tube to the rear through the action of the barrel extension shank. The oil at the rear of the oil buffer tube, under pressure of the piston, seeks to escape to the front side of the piston. Its only path is through restricted openings between the edge of the piston rod head and valve and the oil buffer tube (fig. 11).

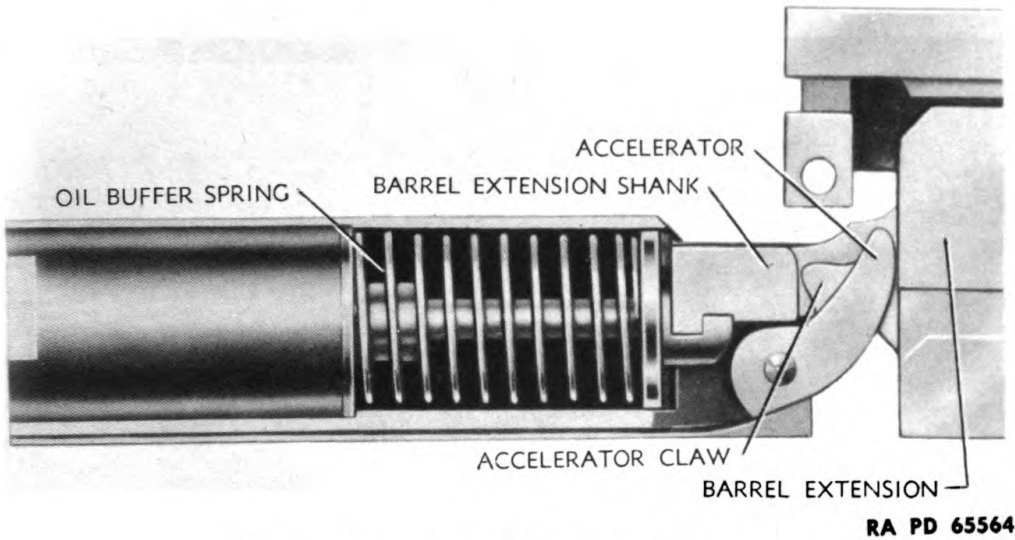
(h) The bolt travels rearward for a total of  $7\frac{1}{8}$  inches. During this travel the driving springs are compressed. The rearward movement of the bolt is finally stopped as the bolt strikes the buffer plate. Thus, part of the recoil energy of the bolt is stored in the driving spring



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**Figure 13 — Bolt Striking Accelerator to Release Barrel Extension**

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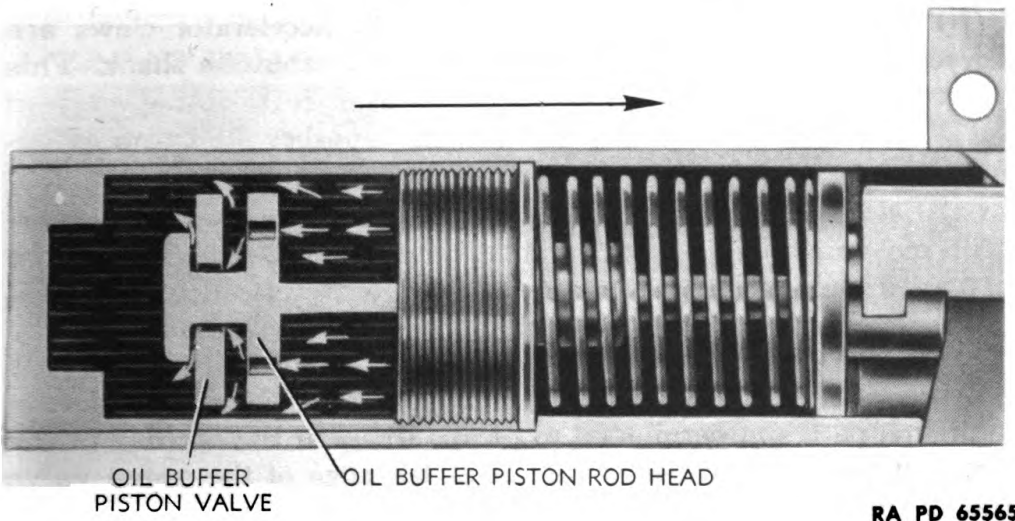


**Figure 14 — Barrel Extension Released**

assembly, and part is absorbed by the buffer disks in the back plate, the remaining recoil is imparted to the mount and absorbed for the main part by the recoil mechanisms. At the end of the recoil movement the parts are in the position shown in figure 12.

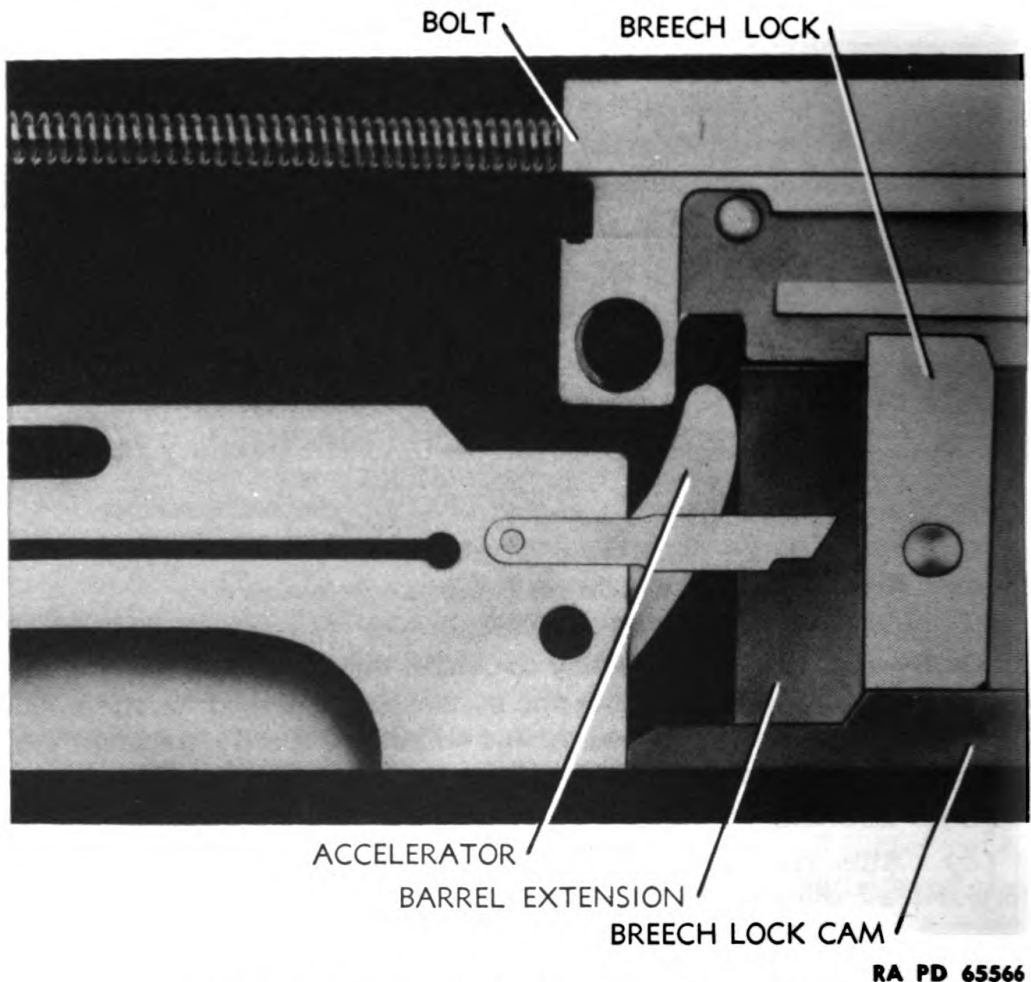
### (3) COUNTERRECOILING.

(a) After completion of the recoil movement, the bolt is forced forward by the energy stored in the driving springs and the compressed buffer disks. When the bolt has moved forward about 5 inches, the tip of the accelerator is struck by the projection on the bottom of the bolt. This rolls the accelerator forward (fig. 13).



**Figure 15 — Action of Oil Buffer During Counterrecoil**

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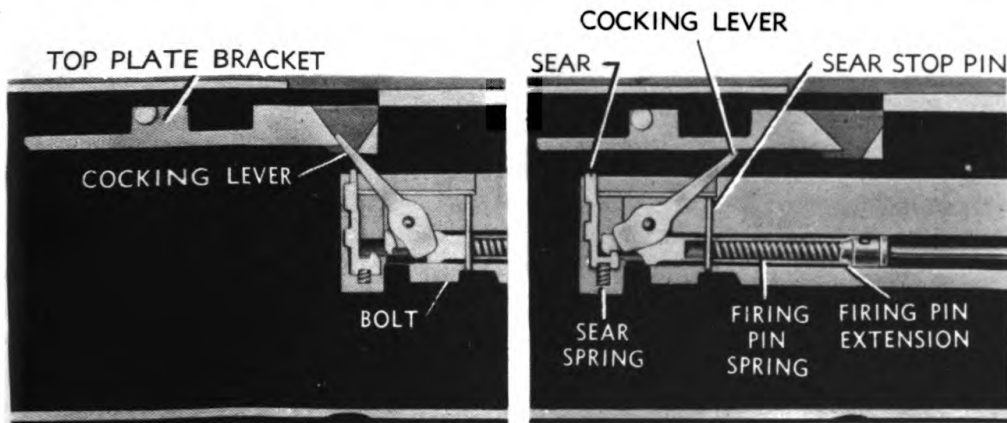
**Figure 16 — Breech Lock Engaged in Bolt**

(b) As the accelerator rolls forward, the accelerator claws are moved away from the shoulders of the barrel extension shank. This releases the oil buffer spring. The energy stored in the spring, assisted by the forward movement of the accelerator, pushes the barrel extension and barrel forward, as shown in figure 14.

(c) No restriction to motion is desired on the forward or counter-recoil movement of the barrel and barrel extension; therefore, on the forward stroke additional openings for oil flow are provided in the piston rod head of the oil buffer assembly. The piston valve is forced away from the piston rod head as the parts move forward by the resistance of the oil, thus uncovering these additional openings. This provides an additional path and permits oil to escape freely at the opening in the center of the piston valve as well as at the edge of the piston valve next to the tube wall (fig. 15).

(d) As the barrel extension moves forward, the breech lock engages the sloping face of the breech lock cam and the breech lock is

## DESCRIPTION AND FUNCTIONING OF THE GUN



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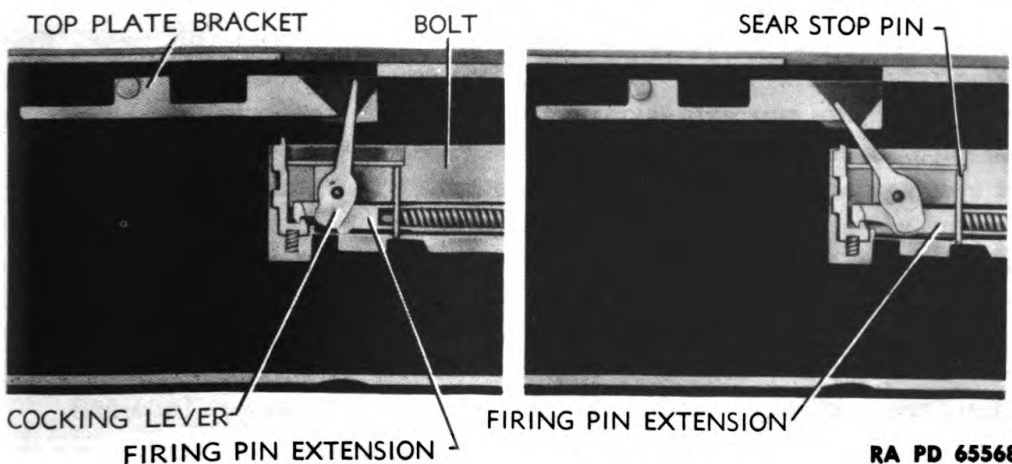
**Figure 17 — Action of Cocking Lever During Recoil Movement of Bolt**

forced upward. The bolt, which has been continuing its forward motion since striking the accelerator, has at this instant reached a position where the locking notch on the under side is directly above the breech lock, thus permitting the breech lock to engage the bolt. The bolt is thereby locked to the barrel extension and barrel just before the recoiling portion reaches the firing position (fig. 16).

### (4) COCKING.

(a) The act of cocking the gun is begun as the bolt starts to recoil immediately after firing. As the bolt moves rearward, the tip of the cocking lever, which is engaged in the V-slot in the top plate bracket, is forced forward. At the time of firing, the parts are positioned as shown in figure 17.

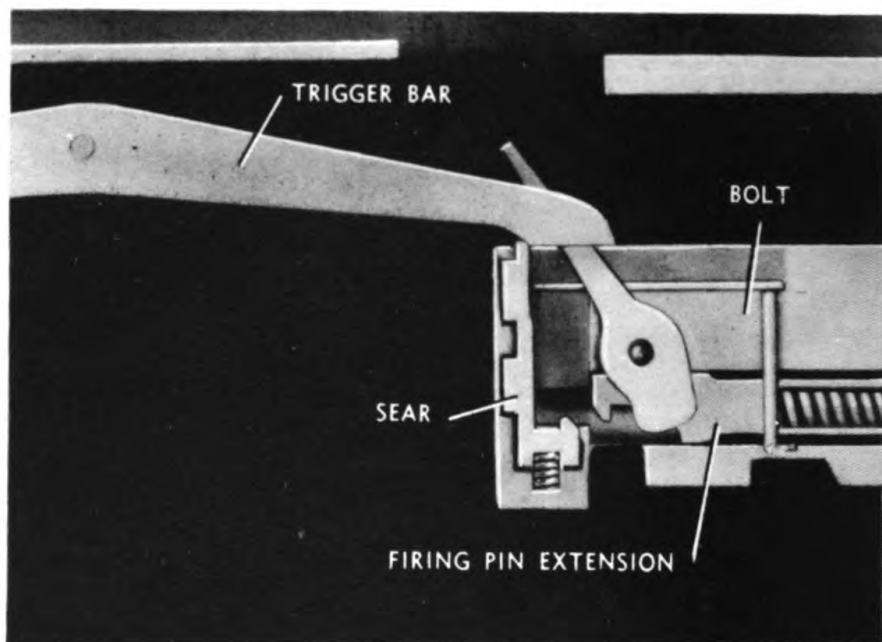
(b) The cocking lever is pivoted so that the lower end forces the



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**Figure 18 — Action of Cocking Lever During Counterrecoil Movement of Bolt**

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



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**Figure 19 — Hand Trigger Action on Sear During Automatic Firing**

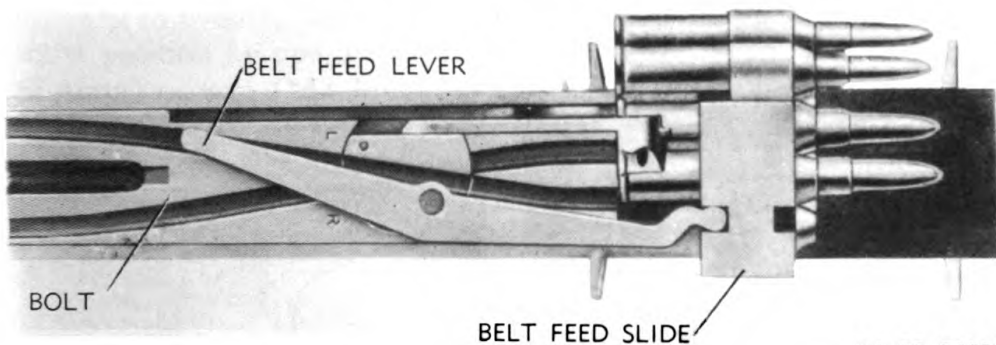
firing pin extension rearward. The firing pin spring is thus compressed against the sear stop pin. The shoulder of the notch in the rear end of the firing pin extension is hooked over the hook at the lower end of the sear under pressure of the sear spring and held in position by the pressure of sear and firing pin springs (fig. 17). There is a slight overtravel of the firing pin extension to insure proper engagement with the sear. This overtravel is taken up and consummated as the bolt starts forward, thus relieving the pressure on the cocking lever.

(c) During the forward movement of the bolt, the tip of the cocking lever enters the V-slot of the top plate bracket from the rear. This action swings the lower end of the cocking lever out of engagement with the firing pin extension; thus permitting the firing pin to snap forward to fire the cartridge when released by the sear, cammed out of engagement by the lateral movement of the sear slide acted upon by the side plate trigger, or by the depression of the sear by the trigger bar. The tip of the cocking lever remains in engagement with the top plate bracket until the bolt is locked, thus if the firing pin becomes disengaged prematurely, its forward movement will be impeded by the cocking lever, and hence premature firing is prevented. Figure 18 shows the cocking lever being rotated as the bolt moves forward.

(d) When the recoiling portion is approximately  $\frac{1}{16}$  inch from the forward position, the gun is ready to fire (fig. 18). If the hand trigger or side plate trigger cam is not in the depressed position at this instant, the recoiling group assumes its fully forward (battery) position and the



## DESCRIPTION AND FUNCTIONING OF THE GUN



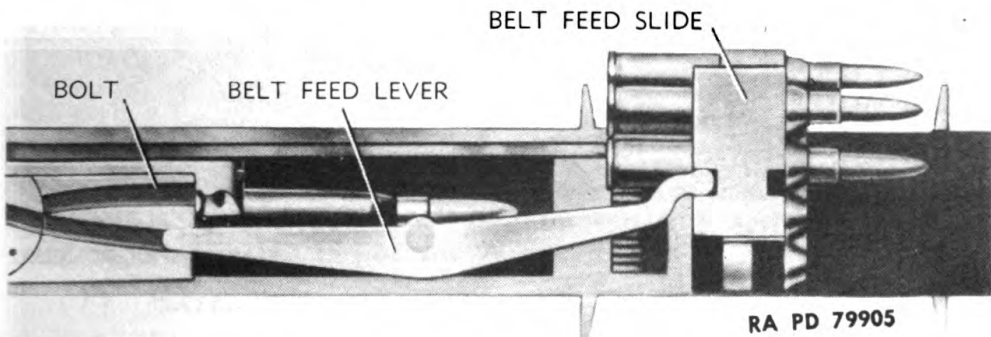
**Figure 20 — Top View of Belt Feed Mechanism—Bolt in Forward Position**

gun ceases to fire. The parts are now in the position shown in figure 4 and the gun is again ready to fire.

### (5) AUTOMATIC FIRING.

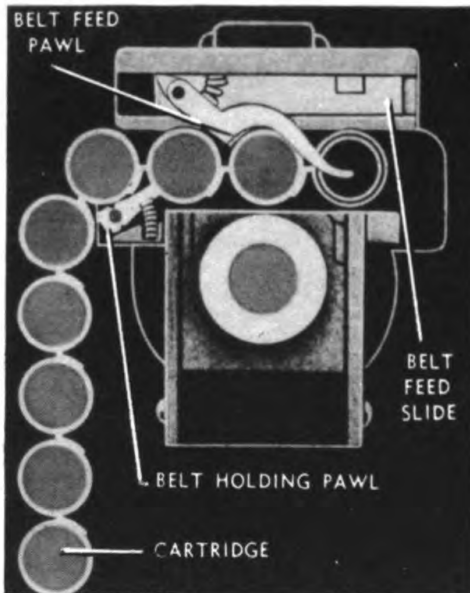
(a) For automatic firing, the hand trigger is pressed and held down. The sear is depressed as its top is carried against the cam surface of the forward end of the trigger bar by the forward movement of the bolt near the end of the counterrecoil movement (fig. 19). The hook on the sear releases the firing pin extension and the firing pin, thus automatically firing the next cartridge at the completion of the forward movement. The gun fires automatically as long as the trigger is held down and until the ammunition supply is exhausted.

(b) When fired by the side plate trigger, approximately the same action takes place except that the firing of the gun is in reality semi-automatic, as the trigger control mechanism on the mount operates the side plate trigger to press the cam against the sear slide as the gun recoils in the mount. Operation of the side plate trigger cam is attained by the rearward movement of the side plate trigger slide. The side plate trigger slide is in turn operated by a lug on the trigger control mechanism slide on the mounts. When held in the rearward position, this lug strikes the lug on the side plate trigger slide as the gun moves

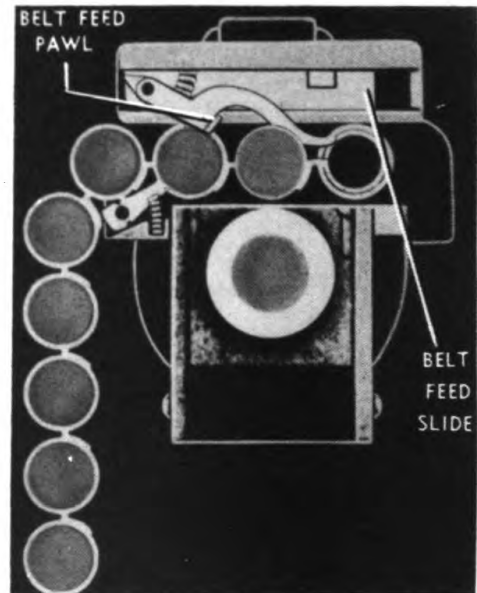


**Figure 21 — Top View of Belt Feed Mechanism—Bolt in Rearward Position**

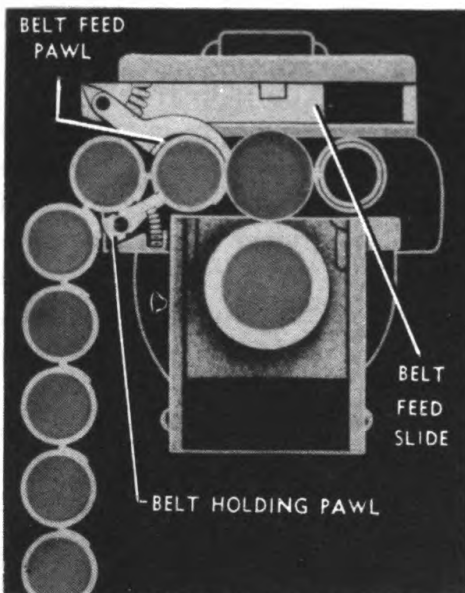
**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**



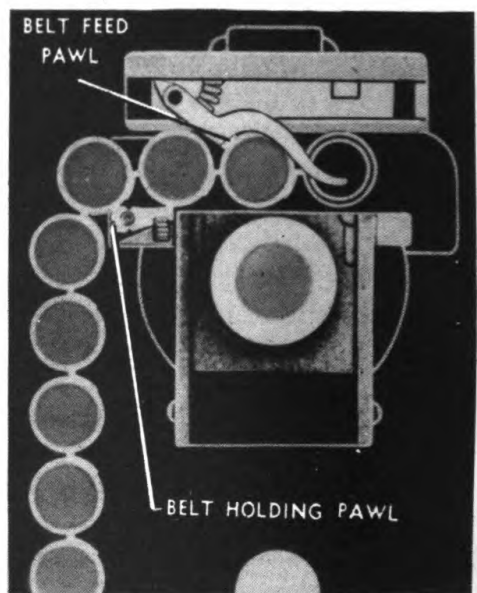
**POSITION A**



**POSITION B**



**POSITION C**



**POSITION D**

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**Figure 22 — Belt Feed Mechanism — Parts in Various Positions of Feeding**



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forward in counterrecoil. The trigger control slide is held in the rearward position by operating the trigger control lever (M2 and M2A1 Mounts) or grip (M3 Mount). The action of the lever or grip when acting through the trigger control and side plate trigger mechanism is similar to that of the hand trigger and trigger bar in the gun. The side plate trigger acts through the sear slide and the trigger bar acts directly upon the top of the sear to force the sear down to release the firing pin to fire the gun. Further explanation of the trigger control mechanism and side plate trigger is contained in section pertaining to the mount.

### (6) FEEDING.

(a) The belt feed mechanism is actuated by the bolt. When the bolt is in the forward position, the belt feed slide is within the confines of the gun. A cam lug on the rear of the belt feed lever is engaged in the diagonal cam groove in the top of the bolt. Figure 20 shows the mechanism as from above with the cover removed.

(b) As the bolt moves rearward during recoil, the belt feed lever is pivoted. The forward end of the belt feed lever moves the belt feed slide out of the side of the gun and over the ammunition belt as shown in figure 21. Ammunition feed shown is from the left side of the gun. Feed from either side is possible with all cal. .50 M2 Guns as these guns have alternate feed bolts.

(c) The ammunition belt is pulled into the gun by the belt feed pawl which is attached to the belt feed slide. When the bolt is forward, the belt feed pawl has positioned a cartridge directly above the chamber. The belt holding pawl is in a raised position to prevent the ammunition belt from falling out of the gun (position A, fig. 22).

(d) As the bolt recoils, the belt feed slide is moved out over the belt, and the belt feed pawl pivots so as to ride over the link holding the next cartridge in the belt (position B, fig. 22).

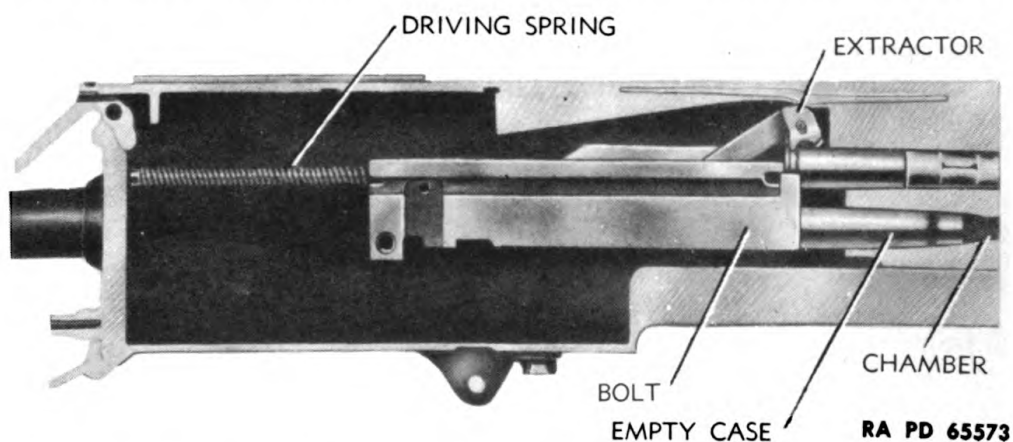
(e) At the end of the recoil movement, the travel of the belt feed slide is sufficient to permit the belt feed pawl to snap down behind the link holding the next cartridge in order to pull the belt into the gun (position C, fig. 22).

(f) As the bolt moves forward on the counterrecoil movement, the belt is pulled into the gun by the belt feed pawl. The belt holding pawl which is spring-operated, is forced downward as the belt is pulled over it (position D, fig. 22). When the forward movement of the belt is completed, the belt holding pawl snaps up behind the next cartridge, as shown in position A, figure 22.

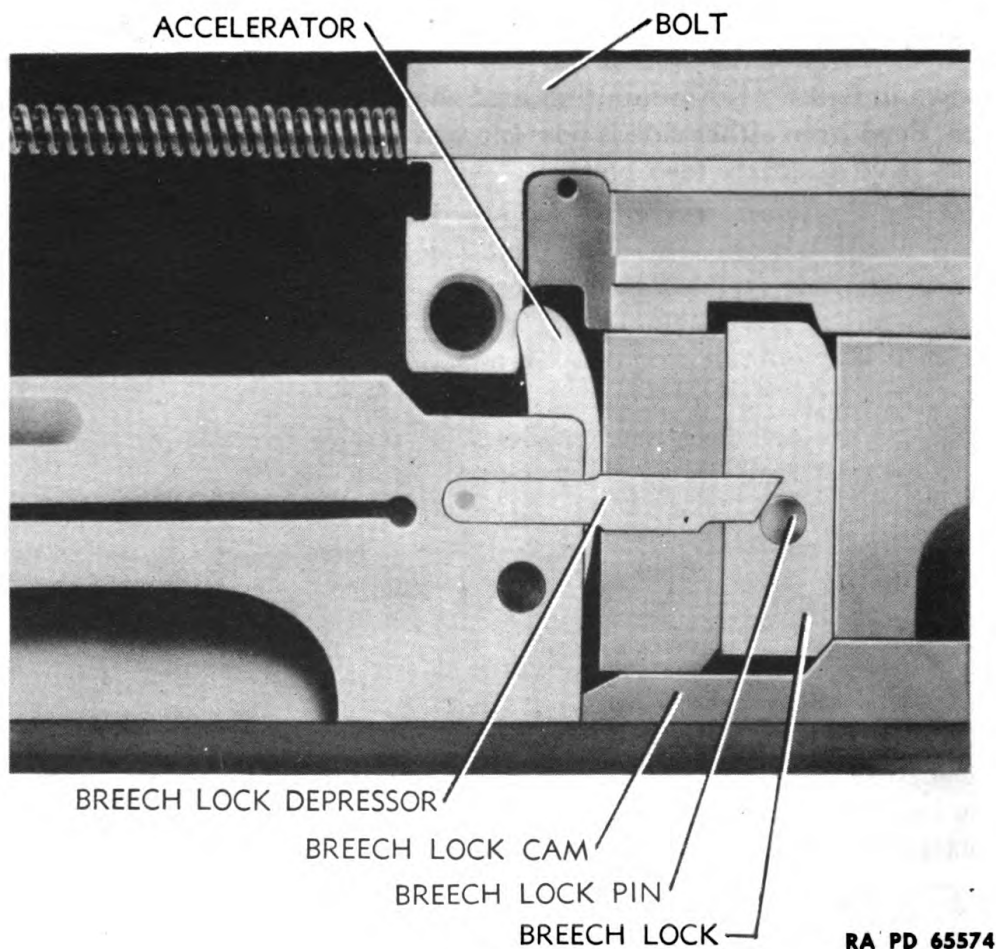
### (7) EXTRACTING AND EJECTING.

(a) As recoil starts, a cartridge is drawn from the ammunition belt by the extractor, and the empty case is withdrawn from the chamber by the T-slot in the forward end of the bolt (fig. 23).

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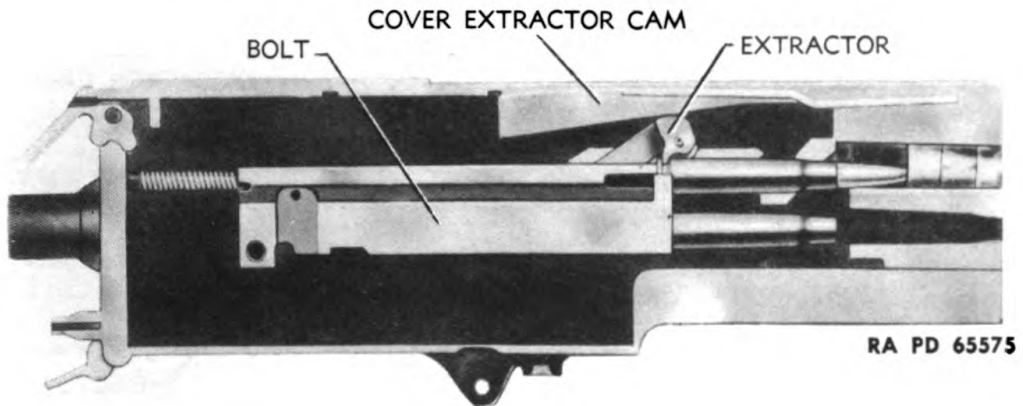


**Figure 23 — Bolt Extracting Fired Cartridge from Chamber, and Extractor Extracting Live Cartridge from Link Belt at Start of Recoil Movement**



**Figure 24 — Beginning of Unlocking of Bolt**

## DESCRIPTION AND FUNCTIONING OF THE GUN



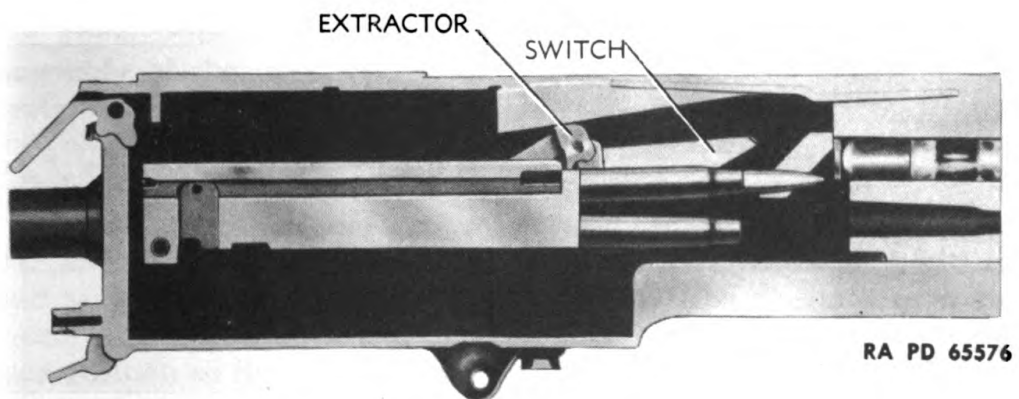
**Figure 25 — Cartridge Entering T-slot**

(b) The empty case, having been expanded by the force of explosion, fits the chamber very snugly and the possibility exists of tearing the case if the withdrawal is too rapid. To prevent this and to insure slow initial withdrawal, the top forward edge of the breech lock and lower forward edge of the notch in the bolt are beveled. Thus, as the breech lock is unlocked, the bolt moves away from the barrel and barrel extension in a gradual manner (fig. 24).

**NOTE:** The slope of the locking faces is to facilitate unlocking and prevent sticking as explained in subparagraph b (2) (c) above. The leverage of the accelerator on the bolt hastens the extraction after it is started by kicking the bolt to the rear.

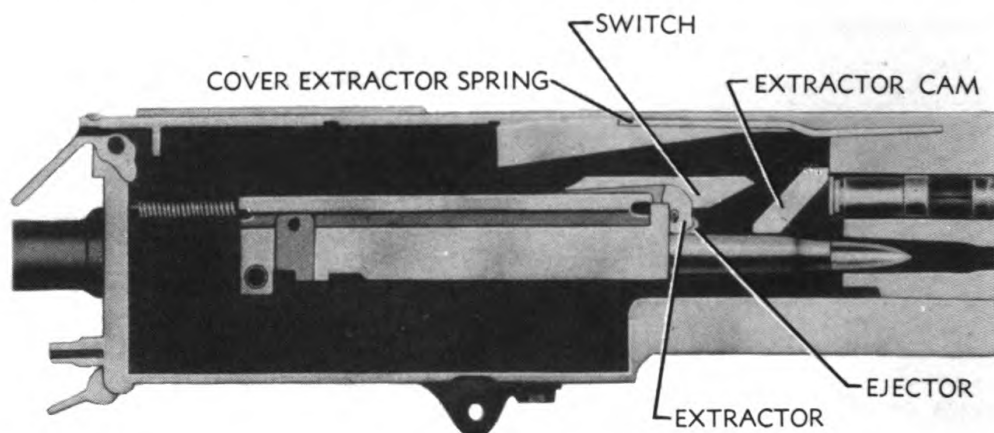
(c) As the bolt moves to the rear, the cover extractor cam forces the extractor down, causing the cartridge to enter the T-slot in the bolt as shown in figure 25.

(d) As the extractor is forced down, a lug on the side of the extractor rides against the top of the switch causing the switch to pivot



**Figure 26 — Ejecting Fired Cartridge Case**

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RA PD 65577

**Figure 27 — Chambering Live Cartridge**

downward at the rear. Near the end of the rearward movement of the bolt, the lug on the extractor overrides the end of the switch, and the switch snaps up to its normal position (fig. 26).

(e) On the counterrecoil movement, the extractor is forced still farther down by the extractor lug riding under the switch. The base of the fed cartridge, gripped by the extractor, is forced down in the T-slot of the bolt and the fired casing ejected. The extractor stop pin in the bolt limits the downward travel of the extractor so that the cartridge, assisted by the ejector, enters the chamber (fig. 27). When the cartridge is nearly chambered, the extractor rides up the extractor cam, compresses the cover extractor spring, and snaps into the groove in the next cartridge through pressure of the spring. The gun mechanism is now set for the beginning of another cycle, which is started by the release of the firing pin.

### Section III

## OPERATION

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### 18. GENERAL.

a. In the description of operation of the gun herein, it is assumed that the gun is properly assembled to the mount and all adjustments with regard to gun and mount properly checked. Such adjustments include the correct headspacing of the gun and the adjustment of the trigger control mechanism and recoil mechanisms of the mount in question, to insure proper functioning with the mounted gun.

b. It is also assumed that the ammunition chest is properly loaded and assembled to the mount, the metallic belt link bag in position on the link chute, and the water chest hoses connected to the water chest and water jacket of the gun, and both chest and water jacket filled with water.

c. In the case of the M2 Mount, it is assumed that the front and rear sight assemblies are assembled to the mount and connected to the off-carriage sight control equipment by means of the flexible cables provided.

d. Instructions for headspacing the gun as well as checking of headspace are covered in paragraphs 45 and 46. Assembly and adjustments of the mounts and mounting of the gun are covered in the sections pertaining to the mount in question. Filling of the link belt, the ammunition, and water chests are covered in section XIII, and assembly of the off-carriage sight control equipment is covered in section X.

### 19. LOADING THE GUN.

a. Before loading the gun, the trigger control hand lever of the M2 and M2A1 Mounts should be in the disengaged, raised position, and secured by the trigger control lock. Also the trigger safety, assembled to the back plate of the gun, should be pushed to the (right) safe position so that the "S" stamped on the safety is fully visible.

b. The safety lock of the M3 Mount covered herein is in the form of a spring-functioned plunger seated in the lug which pivot

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

the lower end of the trigger hand control segment in the frame. When disengaged, lugs on the thumb piece of the plunger seat in shallow recesses in the mounting lug. When the thumb piece is pulled out and turned 90 degrees it may be reseated in deeper recesses which cause the end of the plunger to block the mechanism and prevent retraction of the trigger control mechanism slide on the mount and consequent engagement with the side plate trigger on the gun. This thumb piece should be so seated in the "SAFE" (blocking) position before the gun is loaded.

**CAUTION:** Before loading the gun, the cradle of the mount should be firmly clamped in the "O" elevation position, and locked against traversing (M3 Mount), so as not to shift or swing during loading. Control of the mounts in elevation and traversing is explained in sections VII and VIII, and in paragraph 22.

c. Loading the gun may be considered to include two distinct operations; entering the loaded belt properly into the belt opening in the gun, and thereafter operating the mechanism of the gun until it is closed with a cartridge in the chamber and a cartridge in the feedway gripped by the extractor, ready for extraction from the belt on the recoil movement. The *double loop* end of the metallic link belt should always lead and be inserted in the belt opening, regardless of whether right- or left-hand feeding is employed. When assembled to the mounts covered herein, the gun must be fed from the *left* side. Loaded ammunition chests should be checked to see that the *double loop* end of the belt is leading, and that the bullet end of cartridge will be facing forward when the chest is assembled to the mount. This is essential to the proper loading and functioning of the gun. (Cartridges must be properly inserted in belt links to assure proper flexibility of the belt.)

(1) **FIRST OPERATION OF LOADING.**

(a) The first operation of loading may be performed with the cover either opened or closed. In either case, pull the *double loop* end of the ammunition belt (which should lead) from the ammunition chest and insert it through the feed opening in the trunnion block of the gun, bullets facing forward, until the first cartridge is beyond the belt holding pawl located in the left side of the trunnion block.

(b) With the bolt and other recoiling parts fully forward (in battery), close and latch the cover, if open.

(c) Pull the bolt *completely* to the rear by means of the retracting slide handle.

(d) Release the retracting slide handle and allow the bolt to spring forward.

(e) The cover of the ammunition chest should be closed and latched as soon as the initial operations of loading are completed.

## OPERATION

**NOTE:** This operation pulls the cartridge held by the belt holding pawl into alinement with the chamber where it is gripped by the extractor, ready to be pulled from the link belt when the bolt is again pulled to the rear.

### (2) SECOND OPERATION OF LOADING.

(a) The second operation of loading consists of again pulling the bolt *completely* to the rear, and releasing as in step (1) above. This operation must start with the bolt fully forward, the cover closed and *latched*, and the extractor gripping a cartridge in the feedway.

**NOTE:** This operation pulls a cartridge from the link belt, pushes it into the T-slot of the bolt, and loads it into the chamber with the bolt locked behind it. At the same time the next cartridge in the belt is pulled into alinement and gripped by the extractor ready to be withdrawn on the recoil movement and chambered on the counterrecoil movement of the bolt, when the gun is fired.

(b) The gun is now fully loaded and ready to fire as described in paragraph 21.

## 20. UNLOADING THE GUN.

a. Before unloading the gun, the trigger safety and lock of gun and mount should be placed at "SAFE" and the cradle of the mount secured to avoid movements as explained in paragraph 19 a and b.

b. To unload the gun, unlatch and lift the cover, raise the extractor, retract the bolt about  $\frac{1}{4}$  inch, and remove the ammunition belt from the feedway.

c. Lower the extractor, retract the bolt sufficiently to remove the cartridge in the T-slot, and make a visual inspection of the feedway, T-slot, and chamber to make *certain* that the gun is fully unloaded.

d. Release the bolt, and close and latch the cover.

e. Disengage the safety on gun or mount, press the hand trigger on the gun or the trigger control hand lever (M2 and M2A1) or grip (M3) on the mount, to release the firing pin and thus relieve the tension on the firing pin spring.

f. Replace end of belt (if partly expended) in ammunition chest, and close and latch the cover of the chest. Partly loaded chests should be so marked or fully loaded.

**NOTE:** Frequently, when extracting a live round by hand-charging the subject gun, the bullet jams in the chamber, putting the gun out of action until the bullet is driven out of the chamber and all trace of loose powder is removed. For reasons for such a malfunction and its correction refer to paragraph 25 a (10). *Hand-charging of the gun with a cartridge in the chamber should be held to a minimum.*



**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS****21. FIRING THE GUN.**

a. To fire the gun when completely loaded, it is only necessary to disengage the safety lock of the mount, and operate the firing mechanism. All firing of the guns when mounted is accomplished by the trigger control assembled on the mount. In case of emergency the hand trigger of the gun may be used. In this case the safety must be disengaged before firing.

**b. Firing Gun from M2 or M2A1 Mounts.**

(1) The gun is fired when mounted on the M2 or M2A1 Mounts by first disengaging the trigger control lock from the trigger control hand lever on the mount by lifting it from the notch in the lever, and then pressing the lever downward all the way. The gun will continue to fire automatically as long as the lever is held down, and the ammunition holds out. To cease firing, release the lever.

**CAUTION:** Trigger controls should always be placed at "SAFE" when not engaged in actual firing.

(2) The hand trigger should be kept at "SAFE" unless it is necessary to use it to fire the gun in case of a breakdown of the side plate trigger on the gun or the trigger control mechanism on the mount. The hand trigger is operated to fire the gun by first pushing the safety all the way to the *left* until the letter "F" stamped on the left rear face of the safety is fully showing, and then pressing down on the trigger with the thumbs.

**CAUTION:** When using the hand trigger to fire the gun, care should be observed to grip the buffer tube with the four fingers not engaging the trigger, and to allow the elbows to remain free to keep them from being jammed against the back rest when the gun recoils in the mount when firing. This is necessary only in the case of the M2 and M2A1 Mounts, and where flexible back plates are without spade grips.

**c. Firing Gun from M3 Mount.**

(1) The gun is fired when mounted to the M3 Mount by first disengaging the trigger lock from the trigger control slide rod. This is accomplished by pulling the thumb piece out of the deep notches in the housing, turning it 90 degrees, and then seating it in the shallow notches; then rotating forward one of the three hand grips on the *left-hand* side of the trigger frame. The gun will continue to fire automatically as long as the grip is held in this position and the ammunition holds out. To cease firing, release the grip.

**CAUTION:** The trigger control mechanism should be locked in the *safe* position when the gun is not being fired.

(2) There are three fire control grips mounted on the left-hand member of the trigger control frame, which are connected to a segment which is in turn connected to the trigger control rod which



## OPERATION

operates the slide and hence the side plate trigger of the gun. The grips on the right-hand member of the frame are for control of the mount only. The purpose of the three grips is to furnish easy control at different angles of elevation, as explained in section VIII.

### 22. TRAVERSING AND ELEVATION.

a. **General.** Traversing of the mounts covered herein can be accomplished over an arc of 360 degrees. Maximum elevation of the M2 and M2A1 Mounts is limited to approximately 69 degrees and maximum depression to 15 degrees. Maximum elevation of the M3 Mount is 90 degrees and depression 15 degrees. In the case of the M2 and M2A1 Mounts, the cradle, and hence the gun muzzle is traversed, elevated, and depressed by the operator leaning into the crook of the back rest and swinging his body in the desired direction, by use of his legs. In the M3 Mount, like control is attained by grasping the grips of the right- and left-hand members of the trigger frame with the hands, and thus moving the cradle and gun muzzle in the desired direction. Care should be observed when elevating the gun muzzle not to rotate the firing (left-hand) grips accidentally.

#### b. Operation of the M2 and M2A1 Mounts.

(1) These mounts are operated identically with regard to traversing and elevation. In these mounts, the lower end of the pintle seats in a bushing in the pedestal and can be traversed freely 360 degrees. The cradle of the mount, in which the gun is mounted is pivoted on the upper end of the pintle. The side plates of the cradle are pierced by an arced slot, and the cradle clamping bolt extends through these slots and the body of the pintle. A threaded clamping handle is screwed onto the end of the bolt, and by turning it the cradle can be clamped to the pintle or unclamped from it. The handle unclamps the cradle by being pushed downward thereby turning it counterclockwise, and clamps the cradle by being pulled upward thereby turning it clockwise. Explanation of these mechanisms and description of the mounts is contained in section VII.

(2) To elevate or depress the gun muzzle, first press down on the clamping handle and unscrew it sufficiently to unclamp the cradle from the pintle; then, raise or lower the gun muzzle by pressure on the back-rest in the opposite direction. When the desired muzzle elevation is attained, pull up on the clamping handle to clamp the cradle to the pintle. The cradle should always be clamped in position before the operator removes his weight from the back rest, to prevent the muzzle of the gun from dropping with possible damage to the mount.

(3) When firing at airplanes or moving targets where elevation and azimuth are continually changing, the cradle clamp should be left in the unclamped position. In this position the gun muzzle has free universal movement within its limits.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS****c. Operation of the M3 Mount.**

(1) The movement of the M3 Mount is substantially the same as that of the M2 and M2A1 Mounts except that the maximum elevation is greater. The cradle of the mount is pivoted on the cradle trunnion bracket which corresponds to the pintle of the above mounts. This bracket is fastened firmly in a socket which in turn slides over and revolves on the pedestal. The socket can be locked to the pedestal by a clamping handle acting on a brake shoe positioned in the socket and bearing on the pedestal body, thus preventing rotation of the socket and traversing of the gun (fig. 111). A cradle clamping bolt extending through the trunnion bracket is threaded into a nut on the cradle clamping handle. This nut and the head of the bolt, acting through clamping blocks, engaging with the radial edges of the cradle side plates, clamp the cradle to the trunnion bracket and prevent it rotating up or down on the pivot bolts. The nut is turned by a handle hinged to it. Explanation of these mechanisms and description of the mount is contained in section VIII.

(2) **TO TRAVERSE THE GUN MUZZLE.** First, disengage the brake shoe (fig. 108) in the socket by pushing the clamping handle downward until it is perpendicular, and parallel with the pedestal, and engaged by the spring clip retainer mounted on the pedestal; then, swing the cradle left or right as desired by grasping the grips on the side members of the trigger control frame attached to the rear of the cradle of the mount. To lock the socket in position to prevent traversing, pull up the locking lever until it is free of the clip retainer and the socket is locked to the pedestal body.

(3) **TO ELEVATE OR DEPRESS THE GUN MUZZLE.** First, press down on the hinged cradle clamping handle located on the right side of the cradle (fig. 108) and unscrew it sufficiently counterclockwise to unclamp the cradle from the trunnion bracket; then, raise or lower the gun muzzle by pressure on the grips of the trigger frame in the opposite direction. When the desired muzzle elevation is attained, pull up on the clamping handle to lock the cradle to the trunnion bracket.

(4) When firing at airplanes or moving targets where elevation and azimuth are continually changing, both the socket brake shoe, and cradle clamp should be allowed to remain in the disengaged position. In this position the gun muzzle has universal movement within its limits.

## Section IV

### STOPPAGES AND IMMEDIATE ACTION

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#### 23. DEFINITIONS.

a. **Malfunction.** A malfunction is an improper action of some part of the gun or mount, resulting in a stoppage; for example, the failure of the gun to extract an empty cartridge case.

b. **Stoppage.** Any accidental cessation of fire is a stoppage. It may be due to a faulty cartridge or a malfunction of some part of the gun.

c. **Immediate Action.** Immediate action is the term applied to that operation required to clear a temporary stoppage.

#### 24. STOPPAGES.

a. Stoppages may be classed under two main headings; temporary stoppages and prolonged stoppages, as follows:

(1) **TEMPORARY STOPPAGES.** Such stoppages are caused by:

(a) Failure of some part, a duplicate of which is carried with the gun as an organizational spare part, and thus quickly replaceable.

(b) Faulty ammunition.

(c) Neglect of points to be observed before or during firing as described in paragraph 40.

(2) **PROLONGED STOPPAGES.** Such stoppages are caused by a failure of some part that, as a rule, cannot be remedied by the gun squad under fire, or without skilled assistance. These necessarily put the gun out of action for a more or less prolonged period.

b. Stoppages may also be caused by malfunctions of the mounts, such as a breakdown or maladjustment of the recoil or trigger control mechanism which will affect the proper functioning of the mount with the gun to maintain automatic fire.

#### 25. UNUSUAL MALFUNCTIONS.

a. Unusual malfunctions are those which rarely occur, but usually result in a prolonged stoppage. Some such malfunctions are as follows:

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

(1) **RECURRING SHORT ROUNDS.** Excessive wear of parts of the feed mechanism may cause recurring short rounds, which are not gripped and extracted from the feed belt by the extractor. Such short rounds are caused by the extractor hitting the base of the cartridge while attempting to grip it. The cartridge case is thus driven forward and telescoped on the bullet which prevents the extractor from gripping the base of the cartridge. Such movement should not be possible when the rear cartridge stop alining pawl properly grips the base of the cartridge. Inspection of the base of the first such cartridge removed from the belt will show a dent in the rear end of the case made by the corner of the extractor. This stoppage is remedied by inspecting the feed mechanism and replacing worn or defective parts. Inspection of ammunition belts before firing will disclose short rounds due to defective ammunition.

(2) **LOOSE BULLETS.** In some ammunition which has deteriorated from storage or exposure, the front end of the case is not securely crimped on the bullet. When the extractor withdraws the cartridge from the belt the case only is withdrawn, leaving the bullet in the belt. Loose powder scattered in the mechanism may clog the mechanism and cause a stoppage. This stoppage is remedied by removing the obstruction and cleaning the mechanism. The best prevention of this stoppage is a rigid inspection of ammunition prior to firing.

(3) **BROKEN T-SLOT.** A broken T-slot will fail to extract the empty cartridge case from the barrel chamber and will usually scar the rim of the case. This stoppage is remedied by replacing the bolt.

(4) **BROKEN BARREL EXTENSION.** The bolt will not go home and the gun will generally stop firing. In rare cases the gun will fire a few rounds with a broken barrel extension. This stoppage is remedied by disassembling the gun and replacing the broken part.

(5) **UNCONTROLLED AUTOMATIC FIRE.**

(a) Uncontrolled automatic fire is the continuation of fire when the trigger on the gun or trigger control mechanism on the mount is released. If the cause is present before the gun is fired, firing will commence the moment the bolt is home the second time during loading. If the defect occurs during firing of the gun, the gun will not stop firing when the hand trigger or trigger control mechanism on the mounts is released.

(b) This condition may be caused by the forward end of the trigger bar being sprung downward, or the beveled contacting surfaces of the trigger bar and sear being burred. It may also be due to a jammed or broken side plate trigger, jammed sear or sear slide, or jammed or broken trigger control mechanism on the mount.

(c) *To Remedy.*

1. Keep gun directed on target.

## STOPPAGES AND IMMEDIATE ACTION

2. Unlatch cover. (This will cause gun to stop feeding by disengaging the belt feed lever.)

3. Fully unload and disassemble gun, and replace broken, worn, or burred parts. If fault is not with the gun, thoroughly inspect and test side plate trigger and trigger control mechanism on the mounts.

**NOTE:** Uncontrolled firing can also be stopped by twisting the ammunition belt, thereby causing it to jam and so stop feeding. Such practice is, however, not recommended, as a bent or damaged feed mechanism may result.

(6) **SHORT OIL BUFFER.** A short oil buffer will cause the gun, when elevated, to stop after firing a few rounds. Checking for this fault is explained in paragraph 86 e (8).

(7) **TIGHT PACKING.** If barrel packing is too tight, it will result in sluggish operation and stoppages of the gun, due to excessive friction. Muzzle packing (front) is more apt to cause trouble than breech (rear) packing. Such stoppages can be remedied by adjusting the packing to reduce binding as explained in paragraph 65.

(8) **HOT BARREL.** Sluggish operation may also be the result of overheating of the barrel, which will cause it to expand and rub the bearings and possibly freeze. This should not occur if the water jacket is kept filled at all times and the water kept circulating. Length of burst fired should be kept as short as is practical under the conditions of firing, and the water kept circulating by means of the pump in the water chest between bursts of firing and for a reasonable time after cessation of firing in order to reduce the barrel temperature as much as possible. The hottest point of the barrel will be just forward of the chamber. Care should be observed to see that the hoses connected to the water chest are properly assembled to the water jacket, and the crank on the chest is turned in the proper direction, so as to pump the water into the jacket and not suck it out. This keeps the jacket full at all times.

(9) **MISALINEMENT OF AMMUNITION CHEST, FEED TRAY, AND METALLIC LINK CHUTE.**

(a) If the ammunition chest or feed tray is out of line with respect to the feedway in the gun, interference in feeding will result and possible stoppage.

(b) If the metallic link chute or bag are improperly assembled and not kept clear, jamming of the empty links may occur, resulting in a stoppage.

(c) Positioning and firmness of these assemblies on the mount should be checked before firing, to obviate possible trouble.

(10) **TIGHT CHAMBER.**

(a) If the bullet seat in the chamber of the barrel is tight or the cartridge too long or bullet loose, the bullet may remain in the barrel

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when an unfired cartridge is extracted from the chamber by hand retraction of the bolt by means of the retracting slide. When such extraction is necessary, the extracted cartridge should be examined to see that the bullet is not loose or missing. Cartridges with loose bullets should be properly disposed of, and if the bullet remains in the barrel it must be removed and loose powder cleaned from the mechanism before recharging and firing the gun, or else a plugged barrel or burst gun or both, will result. In most cases, such a malfunction is due to the following conditions:

1. New barrel with minimum size chamber.
2. Maximum round.
3. Loose bullet.

(b) Pending the correction of barrels in service and in storage, the following precautionary measures must be taken, particularly where combat is anticipated.

1. Inspect each round of cal. .50 armor-piercing ammunition by pulling on the bullet to determine if it is loose. Reject all ammunition with loose bullets.

2. When practicable, use barrels that have fired at least 100 rounds in a continuous burst.

3. If a new barrel is used, charge the gun manually, using a round of armor-piercing ammunition, to determine whether the bullet is engraved by the lands. If the bullet is engraved, the barrels should be fired a continuous burst of 100 rounds.

(c) *Hand Charging of Guns with the Cartridge in the Chamber Should Be Held to a Minimum.*

(11) **BELT FEED SLIDE FAILS TO LIFT LONG AMMUNITION BELT.**

(a) When feeding of long ammunition belt is interrupted, it may be due to a malfunction of the belt feed slide or a bent belt feed lever.

(b) A new belt feed slide assembly B261110 is available for the Browning Machine Gun, cal. .50, M2, all types. This new slide was made in order to improve feeding operations and to insure continuous feeding when a long ammunition belt is used. It also increases the load-lifting capacity of the gun.

(c) The new belt feed slide assembly B261110 consists of one belt feed slide B147756, and one belt feed pawl spring stud A9363. The old belt feed slide assembly B8965 consists of belt feed slide B8915, and belt feed pawl spring stud A9363.

(d) In the new slide, the slots for the belt feed lever are positioned closer to the belt feed pawl pin by 0.050 inch on one side and 0.020 inch on the other. This slide can be identified by a 1/8-inch hole drilled through the face of the slide, and by the fact that the belt feed lever slots on the two sides of the slide are no longer in line. It can further be

## STOPPAGES AND IMMEDIATE ACTION

identified by the fact that all new slides have a parco-lubrized or penetrate finish.

(e) The outward throw of the new slide in feeding is less than that of the old slide, and the belt feed pawl tends to be pulled further into the center of the feedway. As the cartridge is being centered on the feedway, the pawl pushes on the link rather than on the cartridge. This results in squeezing the link and thus forcing the cartridge firmly over against the cartridge stops. In the past, with the old belt feed slide assembly, this was done by bending the belt feed lever so that the belt feed pawl would ride farther in toward the center of the feedway and feed uniformly from both left- and right-hand sides. This practice must be discontinued, for although it did produce uniform feeding from both sides with the old design of slide assembly, it will cause faulty operation of the gun when the newly designed slide assembly is used. When the newly designed slide assembly is installed, check the belt feed lever to see whether it has been bent. If the lever is bent, it must be straightened so as to position the slide correctly when set for either left- or right-hand feed, or it must be replaced with a new belt feed lever C64278.

(f) At the present time, it is not planned to replace all slides in guns now in service. However, when the feed mechanism does not pull sufficient ammunition, the slide must be replaced with the slide assembly of new design. A quantity of these slides has been manufactured and placed in Field Service Stores for this purpose.

### (12) RUPTURED CARTRIDGE CASE IN BARREL CHAMBER.

(a) A ruptured cartridge case is one from which the base has become separated or partly separated, and hence sticks in the chamber of the barrel instead of being extracted by the bolt on the recoil movement. This will prevent the next cartridge from being loaded into the chamber or cause it to jam. Such a malfunction is usually caused by loose headspace adjustment.

(b) Usually the ruptured case can be removed by inserting a cleaning rod through the barrel from the muzzle end. When this method fails, the barrel with the ruptured cartridge case should be returned to the ordnance maintenance company for clearing.

(c) Ruptured cartridge cases are apt to be more numerous in combat areas. In these areas it will not be practical to send the gun to an ordnance maintenance company because the gun would be out of action for a long period. In such cases the ruptured cartridge extractor should be used to remove the ruptured case. Description and use of the Ruptured Cartridge Extractor, cal. .50, M5, is covered in paragraph 112 b (1) (h).

## 26. STOPPAGES; THEIR CAUSES AND REMEDIES.

a. The following list shows some of the stoppages that might occur while firing the gun, other than those resulting from the unusual mal-

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functions discussed in paragraph 25. An analysis of stoppages, their probable causes, and the remedies, is also given. When analyzing a stoppage that has occurred in a water-cooled machine gun mounted as described in this manual, a check must be made of the parts of the mount which function with it, and the accessories fastened to gun or mount. Points to be checked include the side plate trigger assembled to the gun, trigger control mechanism assembled to the mount, recoil mechanisms of the mounts, attachment of gun to mount, ammunition chest, metallic link chute and bag, and water circulating system. Improper assembly, adjustment, operation, or failure of any of these groups is sufficient to cause a stoppage of the gun.

**TABLE OF STOPPAGES**

Stoppages	Causes and Remedies
(1) First round of the belt is wedged between belt feed pawl arm and belt feed slide, and still-held by extractor and ejector. Recoiling parts did not go to battery position. Extractor lug is on top of the switch. Round is not in chamber.	(1) May be caused by operator not fully retracting bolt before releasing, during second operation of loading. Therefore the extractor was unable to follow normal path during counter-recoil movement. Gun may be charged and fired, provided that components such as belt feed slide, belt feed pawl arm, ejector, extractor, and switch have not been damaged to point that the gun will not function.
(2) Round from middle of belt wedged between belt feed pawl arm and belt feed slide. It is still-held by extractor and ejector. Action did not go to battery position. Extractor lug is on top of the switch. Empty case may be in chamber.	(2) Caused by insufficient recoil due to incomplete ignition of powder charge in previous round. When this stoppage occurs, bullet may be lodged in the barrel bore. If gun is recharged and firing resumed with bullet in bore, serious damage may be caused to gun and operator.
(3) Same conditions listed in item (2) have been found, except that there is no case in chamber or bullet in bore.	(3) May be caused by sluggishness of switch spring in very fast firing gun. Gun may be recharged and firing resumed, but oil buffer should be checked and if found full of oil, it should be closed to reduce rate of fire, and switch spring changed.
(4) Recurring short rounds have been noted. Bolt strikes one side of	(4) Belt feed lever with insufficient throw due to wear, warpage, or mechanical interference produced by



## STOPPAGES AND IMMEDIATE ACTION

### Stoppages

base of cartridge producing dent thereon.

(5) Gun failed to extract third round. Gun stops after two shots without round in chamber.

(6) Gun has stopped because of ruptured cartridge case in barrel chamber.

(7) Gun stopped because round did not fire when struck by firing pin.

### Causes and Remedies

cover, or right-hand side plate, will cause this malfunction. Removal of interference by filing metal at point of interference or replacement of worn belt feed lever, as case may be, will overcome this condition.

(5) Stoppage occurs when gun is firing too early (out of time). Check adjustment of trigger control mechanism of the mount and action of side plate trigger. In gun in which hand trigger is used, change trigger bar and other components if necessary, such as sear and firing pin extension.

(6) Excessive headspace or defective cartridge case is cause of this stoppage. Check headspace by means of headspace gage or by reheadspacing gun in accordance with approved method as prescribed in paragraphs 45 and 46. Remove broken cartridge case from the chamber with cleaning rod (par. 25 a (12) ).

(7) May be caused by the following:

(a) Firing pin spring weak; firing pin binds in bolt; heavy grease, dirt, or excess oil in the firing pin tunnel in bolt. (b) Firing pin extension rides cocking lever because sear spring is so weak that it will not return sear in time to hook onto firing pin extension. (c) Vent hole in base of cartridge has been omitted. (d) Primer is defective. (e) Firing pin is short. (f) Firing pin point broken off. Cases (c) and (d) are revealed by deep indent on primer cap. (a) and (e) are revealed by light indent on primer cap; (b) by light indent on primer cap. In all cases the gun can be recharged and firing resumed, but weak springs or defective parts should be replaced as soon as possible. Dirt, grease, and oil should be

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

**Stoppages**

(8) Gun stopped because belt feed pawl failed to feed next round.

(9) Gun stops because ammunition belt slips back while gun is firing.

(10) Gun stops because extractor failed to extract next round from belt in feedway. Gun is correct-

**Causes and Remedies**

removed from the firing pin tunnel. Make sure that firing pin spring stop pin is flush with the sides of the firing pin extension.

**NOTE:** Latest firing pin spring has following characteristics: length of  $3\frac{7}{32}$  inch plus or minus  $\frac{1}{16}$  inch, 37 coils, wire diameter 0.059 inch. Latest sear spring has following characteristics: length  $\frac{9}{16}$  inch plus or minus  $\frac{1}{32}$  inch,  $6\frac{1}{2}$  coils, wire diameter of 0.033 inch.

(8) May be caused by: (a) Weak belt feed pawl spring. (b) Belt feed lever throw insufficient because of bent belt feed lever or mechanical interference with right side plate or cover. Gun may be recharged and firing resumed, but replace as soon as possible weak spring, or bent belt feed lever, as case may be. If interference exists, remove by filing metal at point where blocking takes place. Blocking of belt feed lever may be caused also by shallow holes in belt feed lever in which belt feed lever plunger and spring is housed. Deepen holes until plunger is flush with side of lever, or replace belt feed lever (par. 25 a (11) ).

(9) Caused by weak belt holding pawl spring; belt holding pawl spring jumped out of seat; belt holding pawl does not rise sufficiently to hold belt in place. Gun may be reloaded and firing resumed but weak spring should be replaced as soon as possible. (Guns of recent manufacture have twin belt holding pawl springs to prevent such malfunction.)

(10) May be caused by weak cover extractor spring, worn extractor, or short round. Gun may be recharged and firing resumed. Worn or defec-

**STOPPAGES AND IMMEDIATE ACTION****Stoppages**

ly timed, but round is not in chamber.

(11) Gun has stopped with recoiling parts not fully home. Belt feed slide protrudes beyond side of cover, and will not go home when cover is closed or raised.

(12) Gun has stopped, with recoiling parts tightly locked in the receiver, not in battery position, and bolt will not go forward or backward.

(13) Gun has stopped because point of bullet hits bottom of barrel.

(14) Gun has stopped because recoiling parts fail to go to battery position.

**Causes and Remedies**

tive components should be replaced as soon as possible.

(11) Caused by belt feed slide pin protruding beyond slide and interfering with cover. Before firing can be resumed, pin must be positioned correctly and staked lightly in place. Check for bent belt feed lever before reloading.

(12) Caused by accelerator prongs caught in breech lock slot on the under side of bolt because oil buffer tube lock assembly allowed excessive play to accelerator. Force bolt back by hitting a brass rod placed on the front upper portion of T-slot. Remove action from gun and check action of oil buffer tube lock assembly. It should be free in its seat at front end of oil buffer body, and any possibility of binding against sides of slot in oil buffer body should be eliminated by removing metal from lock or body. Dirt or foreign matter lodged between lock and buffer body or short oil buffer tube lock will cause this malfunction. A breech lock cam which shows deep wear at point where it is contacted by oil buffer body will also cause this type of malfunction. Remove dirt and foreign matter; replace short oil buffer tube lock and/or worn breech lock cam.

(13) Caused by thin cartridge rim, or worn T-slot in bolt.

(14) Some causes of this malfunction are: one of breech lock depressor rivets sheared off, or one of components failed. In this case, replace broken component. Unevenly loaded belt, a bulged round in chamber, frozen grease in action, or badly positioned ammunition boxes, link ejector chutes, and am-

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

**Stoppages**

(15) Uncontrolled automatic fire.

(16) The gun, when elevated, stops after firing few rounds.

**Causes and Remedies**

munition guides are also sufficient cause for this type of stoppage. Tight headspace may also jam recoiling parts.

(15) By uncontrolled automatic firing is meant the continuation of fire when trigger or sear mechanism is released. Uncontrolled fire is caused by a sprung or damaged trigger bar. Replace damaged trigger bar as soon as possible. Uncontrolled fire may also be caused by damaged or improperly assembled side plate trigger or improper adjustment of side plate trigger and/or trigger control mechanism of mount, or jammed trigger spring.

(16) Usually due to short oil buffer piston rod, or improper assembly of piston rod head (par. 86 e (8) ), which prevents the recoiling parts from going into battery. Such fault may not be noticed until gun is elevated in high-angle fire.

**27. PREPARING STOPPAGES FOR DEMONSTRATION PURPOSES.**

a. Refer to FM 4-135 for a guide giving instruction in stoppages and the application of immediate action thereto.

**28. IMMEDIATE ACTION.**

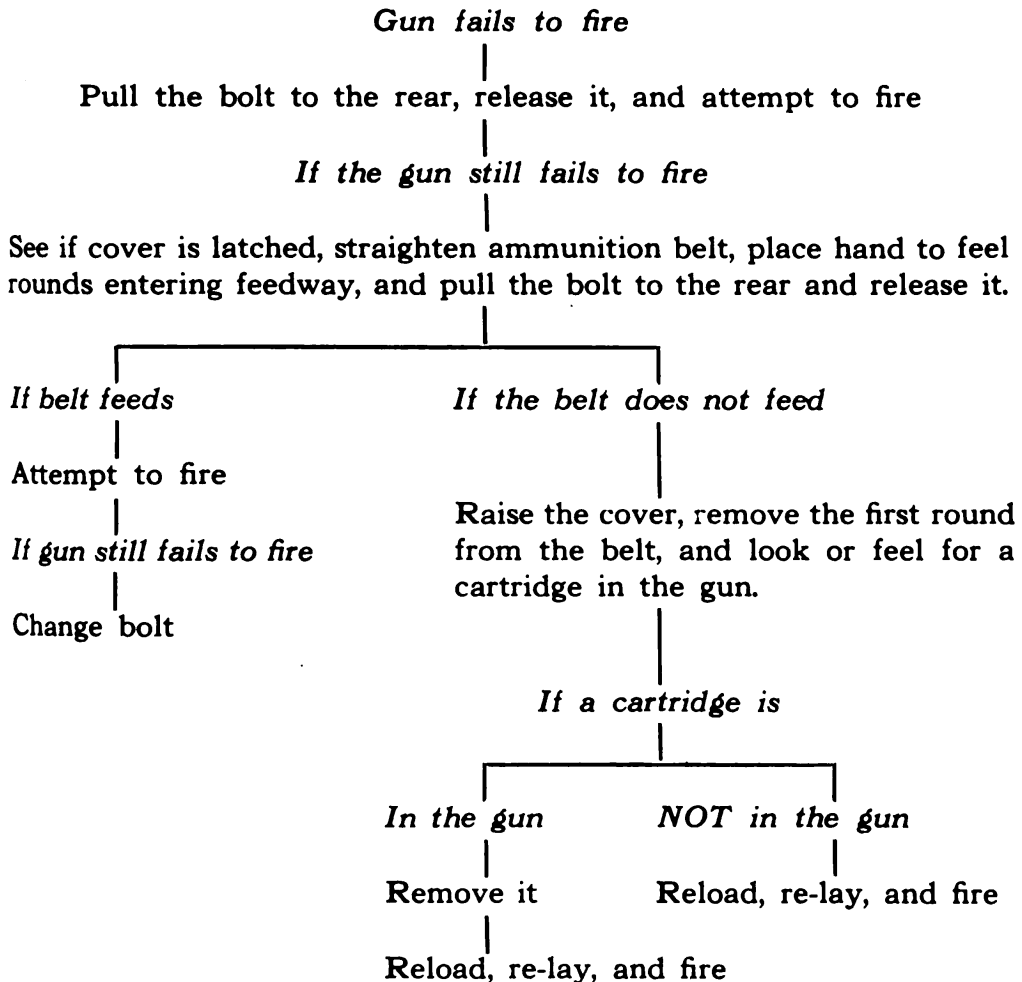
a. Immediate action is the immediate and automatic application of a procedure designed to reduce the majority of stoppages, and place the gun in action in the shortest possible time. Immediate action is concerned with the reduction of stoppages and not the cause.

b. Proper preparation and inspection of the gun, mounts, ammunition chest, and water circulating system, observance of points to be observed before and during firing (par. 40), and inspection of the loaded ammunition belts to eliminate loose bullets, bulged and short rounds, etc., should practically eliminate the need of immediate action.

c. When a stoppage occurs during firing, the immediate action in the diagram below- or such portions as are required to reduce the stoppage should be performed.

## STOPPAGES AND IMMEDIATE ACTION

### TABLE OF IMMEDIATE ACTION



**NOTE:** If application of the procedure does not remedy the stoppage, the gunner must examine the feed mechanism and other parts of the gun and mount in order to locate and remedy the trouble.

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

## Section V

## CARE AND PRESERVATION

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## 29. GENERAL

a. The importance of a thorough knowledge of how to care for and clean the machine gun cannot be overemphasized. The kind of attention given to a weapon of this type determines largely whether or not it will shoot accurately and function properly when needed. The bore and chamber must be kept in perfect condition for accurate shooting. Also, it is just as important that the receiver and moving parts be kept clean, lubricated, and in perfect condition for efficient functioning.

b. The care, cleaning, lubrication, and adjustment of the mounts with which the gun is used, are of no less importance, as the proper functioning of gun and mount together determine the effectiveness of the results achieved. Likewise, the accessories and equipment used with the gun and mount, such as the ammunition chest, water chest and circulating system, and off-carriage sight control mechanism (used with M2 Mount only) should be kept in perfect order for proper functioning when needed.

c. Due to the fact that specifications of oils, greases, and other material used in cleaning, lubricating, and storing guns and mounts are subject to revision from time to time, the *latest revision* of the specification of the item in question should be used, as listed in 'NL K-1 and described in TM 9-850.

## CARE AND PRESERVATION

### 30. CARE AND CLEANING OF THE GUN.

a. Guns should be cleaned, oiled, and lubricated not later than the evening of the day they are fired, preferably immediately after firing. They should also be inspected, cleaned, oiled, and lubricated each day. This is particularly necessary in the case of the bore in order to prevent rusting and corrosion due to the foreign matter which "sweats" out of the minute cracks in the metal.

b. For thorough cleaning, the water jacket should be drained and the groups should be removed from the gun. If necessary, this may be accomplished without draining the water jacket by following the procedure explained in paragraph 43 d (4).

#### c. Cleaning the Bore.

(1) Clean the bore thoroughly with CLEANER, rifle bore. When rifle bore cleaner is not available, use hot soap and water solution (issue soap), SODA ASH, and water solution (1½ teaspoonfuls per pint of water), hot water alone or, in the absence of these, cold water. For use and specifications of cleaners, oils, and rust-preventive compounds, refer to TM 9-850 and SNL K-1 respectively.

#### (2) USE OF RIFLE BORE CLEANER.

(a) Assemble a PATCH, cotton, gun-cleaning, to the cleaning rod and saturate it with rifle bore cleaner. Insert the patch into the chamber of the barrel and move it forward and back, through the entire bore and chamber a number of times. If necessary, use a patch on a stick to further clean the chamber.

**CAUTION:** Rifle bore cleaner, will freeze at temperatures below 32 F. If frozen, it must be thawed and shaken well before using. Closed containers should not be filled to more than 75 percent of capacity in freezing temperatures. Completely filled containers will burst when contents freezes.

(b) Repeat the operation two or three times with clean, freshly saturated patches, then use clean dry patches to remove all the cleaner. If gun has been fired considerably, run a bronze cleaning brush through the bore as prescribed in step (3) (c) below. When bore and chamber are thoroughly cleaned and dry, apply OIL, lubricating, preservative, light, to a clean patch and pass through bore and chamber a few times as a protection against rusting.

**CAUTION:** The bore should always be cleaned from the chamber end when possible to avoid wear at the muzzle.

(c) Use light preservative lubricating oil to protect the bore and chamber only if daily inspection of the weapon is possible. In the event the weapon is to remain out of service for several days and inspection is only possible every 5 days, apply OIL, lubricating, preservative, medium. When placing gun in long term storage, use COMPOUND, rust-preventive, light, in place of oil as explained in paragraph 35.

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(d) Wipe bore and chamber *entirely free* of oil, before firing, with several clean, dry, gun-cleaning cotton patches. When removed from storage, cleaning must be performed by using SOLVENT, dry-cleaning, before applying light preservative lubricating oil (par. 34).

**(3) USE OF SOAP AND WATER OR SODA ASH SOLUTION.**

(a) Place the barrel, muzzle down, in a vessel containing hot water and issue soap solution, a soda ash solution as specified above, or, lacking these, hot or even cold water alone. (Avoid use of caustics.)

(b) Insert cleaning rod, with a gun-cleaning cotton patch assembled, in breech end of barrel, and move rod forward and back for about one minute, pumping the solution in and out of the bore through its entire length. (Wet patch before inserting in bore.)

(c) While the bore is still wet, assemble a bronze wire cleaning brush to the cleaning rod and run it forward and back through the entire length of the barrel three or four times, thus thoroughly scrubbing out the lands and grooves of the bore as well as the chamber.

(d) Assemble a clean patch to the rod; then pump solution, and then clean water, through the bore.

(e) Remove barrel from water, and run a dry clean patch assembled to the cleaning rod through the entire length of the bore and chamber. Repeat this operation until the bore and chamber are thoroughly dry and clean, using gun-cleaning patch on a stick, if necessary, for the chamber.

**CAUTION:** Observe care not to displace or damage rear barrel packing while cleaning the bore.

(f) Oil bore and chamber as prescribed in subparagraph c (2) (b) and (c) above. A *light* coating of light preservative lubricating oil on the exterior of the barrel will help protect it from the water in the jacket when assembled, and provide lubrication for the bearings. No excess oil should be allowed to remain on the rear end of the barrel which might get into the chamber.

**d. Cleaning Bore with Barrel Assembled.**

(1) When it is necessary or advisable to clean the bore between firings while the gun is still in action, it may be accomplished without removing the barrel from the water jacket, by fully unloading the gun, raising the cover, retracting the breech bolt, and hanging it by raising the extractor and engaging the wedge-shaped lug on the left face of the extractor with the notch in the bolt stop protruding from the left-hand side plate. The bore can then be cleaned from the muzzle end, in the usual manner, using a gun-cleaning patch moistened with rifle bore cleaner, then drying the bore with clean dry patches, as already explained. No oil should be applied to bore or chamber during firing. Bore and chamber should be wiped dry of oil



## CARE AND PRESERVATION

before initial firing of the gun as already explained. A dry, clean wiping cloth should be stuffed in the receiver to protect the interior of the gun from fouling and cleaning fluid.

(2) The barrel may be removed without draining the water jacket by following the procedure in paragraph 43 *d* (4). However, when the gun is being completely cleaned and the water jacket flushed out, it is best to drain the jacket before removing the barrel. The barrel should, in either case, be unscrewed from the barrel extension before cleaning the bore. When cleaning the gun, the front and rear barrel packing should be examined to see if it is in good condition. For adjustment of packing refer to paragraph 65.

**NOTE:** When cleaning bore from muzzle end, care should be observed to hold cleaning rod straight so as not to cause wear of muzzle.

### e. Cleaning Parts Other Than the Bore.

(1) Under active combat conditions, the gun should be removed from the mount, disassembled completely, and inspected at least once each day. When considerable firing is done, it should be disassembled and inspected thoroughly even more often. For a thorough cleaning of the parts dry-cleaning solvent should be used, the parts thoroughly dried and *immediately* oiled to prevent rusting. If dry-cleaning solvent is not available, a lightly oiled wiping cloth will suffice. The parts should then be wiped dry and oiled.

**NOTE:** When dry-cleaning solvent is used, the parts should not be touched with bare hands until oiled, as the solvent removes every trace of oil or grease and thus promotes rusting.

(2) With groups removed, wipe the casing clean, and take care to remove dirt from under the belt holding pawl. Then thoroughly wipe clean the cover, bolt, barrel extension, oil buffer group, and back plate; use a small stick covered with a gun-cleaning cotton patch to remove dirt from recesses. After cleaning, dry all parts and oil with an oiled wiping cloth, using light, preservative, lubricating oil; be extremely careful to apply just the right amount of oil. The thickness of the film of oil to be applied must necessarily depend upon climatic conditions. An effective method is to saturate a CLOTH, wiping, with oil and wring out before rubbing on surfaces. Excess oil not only attracts dirt and grit, thereby causing undue wear of parts, but in cold climates may cause sluggish operation or "freezing" of the gun (CAUTION, par. 34 a). Make especially certain that oil does not enter the firing pin recess in the bolt, and keep it at a minimum in the vicinity of the barrel end of the barrel extension, in order to preclude oil entering the chamber of the barrel. The rear end of the barrel, where it enters the trunnion block, should be *lightly* oiled.

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(3) Where guns are kept mounted, ready for immediate use, keep the bore and mechanism, and the outside of the casing, lightly oiled with light, preservative, lubricating oil, using a lightly oiled cloth as prescribed above. Before firing guns, the bore and chamber should be wiped *dry*. In cold climates, oil as prescribed in paragraph 114. Where possible, when not in use, guns and mounts should be kept covered.

**31. CARE AND CLEANING OF THE MOUNTS.**

a. The mounts and accessories, such as the ammunition chest, water chest, and antiaircraft control equipment set should also be kept clean and lubricated. They should be wiped off daily with a clean wiping cloth, and if necessary, the painted portions washed, and the unpainted metal surfaces kept lightly oiled to prevent rust and corrosion. Oil, however, should be kept from all rubber hoses or connections. Painted parts should be kept in condition and repainted when and where necessary as prescribed in section XV. Contacting moving surfaces should be inspected and oiled with light, preservative, lubricating oil. For procedure to preserve camouflage, refer to section XV.

b. The pintle and pintle bearing of the M2 and M2A1 Mounts should occasionally be cleaned and oiled. The pedestal of the M3 Mount should not be disassembled except for repair.

c. Such parts and assemblies as the trigger control mechanisms and front and rear sight mechanism (M2 Mount) should be cleaned, oiled, and lubricated. These mechanisms should not be disassembled except by qualified ordnance personnel. The recoil mechanism should be cleaned, oiled, and lubricated as far as possible, without disassembling. For lubrication refer to paragraph 32.

d. Oiling and lubrication of moving parts should be light, and parts inspected frequently as excess oil attracts grit and foreign matter and causes excessive wear. Oiling should be done with light, preservative lubricating oil, as prescribed in the care of the gun.

**32. LUBRICATION OF THE GUN AND MOUNTS.****a. General.**

(1) Proper lubrication is second in importance only to intelligent cleaning and oiling for rust prevention.

(2) Lubrication should be accomplished carefully and sparingly. Oil should *not* be carelessly squirted at the point or on the surface to be lubricated, and any excess oil should be wiped off. This is particularly important with regard to the bolt and rear end of the barrel of the gun in order to keep oil from getting into the chamber. Any oil or grease in the chamber of the barrel will raise the breech

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pressure to a hazardous point when the gun is fired and may result in a blown bolt, a ruined gun, and serious injury to personnel.

(3) Excess of oil attracts grit and foreign matter which may clog the mechanism and cause a malfunction or stoppage. In any case, it will be conducive to excessive wear of the moving parts.

(4) Correct lubrication is especially important in areas of low temperatures, or where dust and sand storms are apt to occur. Correct procedure in such instances is contained in section XIV.

(5) Excessive lubrication may often be noticed by smoking of the operating mechanism of the gun when firing.

(6) In all lubrication of gun and mounts, light, preservative lubricating oil should be used, except where grease is specified. To lubricate the bearings of the M3 Mount which are fitted for grease lubrication, use the lubrication gun filled with GREASE, O.D. No. O, for temperatures above plus 32 F and in the No. OO below plus 32 F.

### b. Points To Be Lubricated in the Gun.

(1) Under normal conditions all bearing surfaces of moving parts should be lightly lubricated. This is best accomplished with an oiled cloth or with the oiler. When the oiler is used, oil should be applied sparingly and the excess oil wiped off. In addition to the general lubrication already mentioned, special attention should be paid to the following points:

- (a) Cover extractor cam.
- (b) Cover extractor spring.
- (c) Guideways of the belt feed slide.
- (d) Cocking lever.
- (e) Belt feed lever grooves in the bolt.
- (f) Guideways in the barrel extension taking the bolt guides.
- (g) Breech lock cam guides and top.
- (h) Switch pivot.
- (i) Side plate trigger slide.
- (j) Breech lock.
- (k) Rear end of barrel.

(2) The gun should be cleaned and lubricated daily, and before and after firing and during temporary cessation of firing when much is done.

### c. Lubrication of the Mounts.

(1) In general, lubrication of the mounts can be accomplished in a similar manner to that of the guns, although fewer moving parts are concerned. General lubrication and oiling of the pintle (M2 and M2A1) and trunnion bracket socket (M3) of the mounts has been covered in cleaning of the mounts.

(2) In the case of the M3 Mount the recoil guides, trunnion bracket socket, and cradle pivot bolts are supplied with grease gun

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connections, thus lubrication of these points will last for a considerable period. Every 6 months apply GREASE, O. D. (seasonal grade), using the lubrication gun supplied for the purpose. Points to be lubricated are:

- (a) Trigger control slide (oil).
- (b) Recoil mechanism guide rods (grease).
- (c) Socket bearing in pedestal (grease).
- (d) Cradle pivot bolts in trunnion bracket (grease).

(3) The principal points to be lubricated (with oil only) on the M2 and M2A1 Mounts are:

- (a) Trigger control slide.
- (b) Exposed reciprocating surfaces of upper buffer spring sleeve.
- (c) Recoil mechanism slide and compensating spring guide rod. (Oilholes are provided in top of the slide and housing for use of oiler. A wiping washer is assembled to the slide to distribute oil on the slide. This washer should be kept in repair at all times and replaced when necessary.) The slide should be lubricated every two hours when the gun is firing over long periods.

(d) Right and left racks, where they enter the recoil mechanism frame. (Tooth segments of the racks and pinions should be kept clean but sparingly lubricated or foreign matter will collect and produce wear and possible clogging.)

(e) Pintle should be lifted from the pedestal occasionally, cleaned and oiled lightly. The pintle bearing in the pedestal should also be wiped clean at the same time.

(f) Elevating and traversing screws of front sight mechanism (M2 Mount only) should be kept clean and lightly lubricated daily when in use.

(g) The lower buffer recoil spring should be kept greased as explained in paragraph 76 e (7) (a).

**33. CARE AND CLEANING UNDER UNUSUAL CONDITIONS.**

a. When operated in cold climates, or where sand or dust are excessive, oiling and lubrication are held to a minimum to assure proper functioning of the weapon and prevent "freezing" and undue wear. Instructions for care, cleaning, and lubrication in hot and cold climates, and where salt air and sand storms are encountered is covered in detail in section XIV. These instructions must be carefully followed to avoid malfunction of the gun and mount.

**34. CLEANING MATERIEL RECEIVED FROM STORAGE.**

a. Materiel received from storage will be coated with either light, preservative lubricating oil; OIL, lubricating, preservative, medium; or COMPOUND, rust-preventive, light. Materiel received from long-

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time ordnance storage may be coated with COMPOUND, rust-preventive, heavy. Materiel so protected should be completely disassembled and the oil or compound completely removed using dry-cleaning solvent. The solvent may be applied with swabs to the large parts and as a bath for the small parts of the materiel. Particular care must be observed to remove all traces of the oil or compound from bore and chamber of the gun barrel, and all springs and recesses in which springs and plungers operate in gun or mount. After using the dry-cleaning solvent, make sure that it is completely removed from all parts by wiping with clean wiping cloths. (In damp climates be sure the wiping cloth is dry.) When the parts have been thoroughly cleaned and dried, cover all unpainted surfaces *immediately* with a light coating of light preservative lubricating oil to prevent rusting. Dry-cleaning solvent removes all traces of grease and oil and parts will rust very quickly unless immediately protected. Parts should be handled with gloves before oiling to prevent moisture from the hands from attacking the metal. Oil is best applied by using a wiping cloth or PATCH, cotton, gun-cleaning saturated in oil and then wrung out.

**CAUTION:** Failure to clean the firing pin, driving springs, and sear spring, and the tunnels in the bolt in which they operate may result in gun failure at normal temperatures, and will most certainly result in serious malfunctions if guns are operated in low-temperature areas, as rust-preventive compound and other foreign matter will cause the lubricating oil to congeal or freeze on the mechanism.

b. In degreasing the mounts, special attention should be paid to the slide in the trigger control mechanism, and the recoil mechanisms and like moving parts, to make sure all compound is removed.

c. Dry-cleaning solvent is an inflammable, noncorrosive petroleum distillate, used for removing oil and grease. It should not be used near open flame and smoking is prohibited where it is being used. It will attack and discolor rubber. In an emergency CARBON TETRACHLORIDE, or Diesel fuel may be used in place of dry-cleaning solvent. The use of gasoline is dangerous and prohibited, and the use of caustics should be avoided.

d. **Light Preservative Lubricating Oil.** While this oil is entirely suitable for the preservation of the gun and mount while the equipment is in use, it should not be used for even short term storage unless daily inspection is possible.

### 35. PREPARING MATERIEL FOR STORAGE.

a. **Medium Preservative Lubricating Oil.** This oil is suitable for preserving the mechanisms of guns and mounts, as well as the polished surfaces and the bore and the chamber of the gun for a period of from 2 to 6 weeks, dependent on the climatic and storage

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conditions. Materiel in short-term storage, however, should be inspected every 5 days and the preservative film renewed if necessary.

**b. Light Rust-preventive Compound.** This compound is a semi-solid material. This compound is efficient for preserving the polished metal surfaces, the bore and the chamber of the gun for a period of 1 year or less, dependent on the climatic and storage conditions. It is best applied by reducing the compound to a fluid state by indirect heating as explained in subparagraph c, below. The compound can then be applied as described in subparagraph d, below. If heating facilities are not available, the compound can be brushed on at a temperature as low as 60 F.

**c. Heavy Rust-preventive Compound.** This compound is a very viscous petroleum product, used for the protection of finished surfaces during dead storage. It may be heated in a suitable tank so that the materiel may be coated by dipping, or brushed on the finished surfaces of the larger parts. It is inflammable, and precautions must be taken to avoid overheating. The compound must not be heated over an open flame. A practical method of obtaining fluidity is to place the container in a vessel of water, heating it to a temperature of about 180 F, the exact temperature being determined by the thickness of the film desired. The higher the temperature of the grease, the thinner is the film applied to the metal. The best temperature is that at which the grease is fluid enough to form a uniform film of maximum thickness which can be retained on the metal in storage. The grease should be heated to the temperature at which used for about  $\frac{1}{2}$  hour before using. Best results will be obtained if the compound is heated slightly above this temperature and then allowed to cool to the desired constituency before using. During heating, the compound should be stirred to eliminate bubbles of air, or water vapor. The presence of water will be indicated by frothing on the top of the bath. For detailed explanation of use, and specifications of the compound, refer to TM 9-850 and SNL K-1.

**d.** The materiel should be cleaned and prepared with particular care. The bore and all parts of the mechanisms of gun and mounts, outside and in, should be thoroughly cleaned with dry-cleaning solvent and then dried completely with a clean, dry wiping cloth. In damp climates, particular care must be taken to see that the cloth is dry. After drying a metal part, the bare hands should not touch that part. All finished metal parts should then be coated with light, preservative lubricating oil; or medium, preservative lubricating oil; or light (or heavy) rust-preventive compound, depending upon the length of storage time anticipated. Application of the rust-preventive compound to the bore of the gun barrel is best accomplished by dipping the cleaning brush attached to the cleaning rod in the fluid compound and then running it through the bore and

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chamber two or three times. The cleaning brush must be *clean* and care taken to see that the entire surface of the bore is coated. Before placing the gun in the packing chest, see that the bolt is in the forward position, the cover latched, and the firing pin released to relieve the strain on the firing pin spring. Then, handling the gun with gloves, place it in the packing chest, the wooden supports of which having been previously painted with rust-preventive compound. If possible, steps should be taken to separate the metal surfaces of the gun and mount from the wooden supports by at least two layers of PAPER, greaseproof, wrapping, and one of PAPER, Kraft, wrapping, water-proofed. Under no circumstances should the gun be placed in storage contained in a cloth or other cover, or with a plug in the bore. Such articles collect moisture which causes the weapon to rust.

e. For instruction in packing, marking, and shipping, refer to the ordnance storage and shipment publications listed in section XVI.

### 36. METHOD OF FILLING THE OIL BUFFER.

a. With the oil buffer assembly removed from the gun and oil buffer body assembly, remove the oil buffer tube filling screws from the base of the tube. Then using the OILER, filling, oil buffer, (filled with OIL, recoil, light) fill the buffer tube as follows:

(1) Start the flow of oil by pressing on the base of the oiler, and while the oil continues to flow from the oiler, insert the nozzle into either filling hole and with a continued pressure on the base of the oiler, allow oil to flow into the buffer tube. *Do not release pressure on the oiler until the nozzle has been removed from the filling hole, thus preventing air bubbles from being formed in the tube.*

(2) Repeat the operation until the buffer is overflowing, and then replace the filling screws. Any excess oil in the buffer will be relieved by the relief valve in the buffer tube cap. The reason that two filler holes are provided is to show visually, by overflow, when the buffer tube is completely full and to allow an escape of air while filling.

NOTE: The piston should be in the fully forward position when filling the buffer.

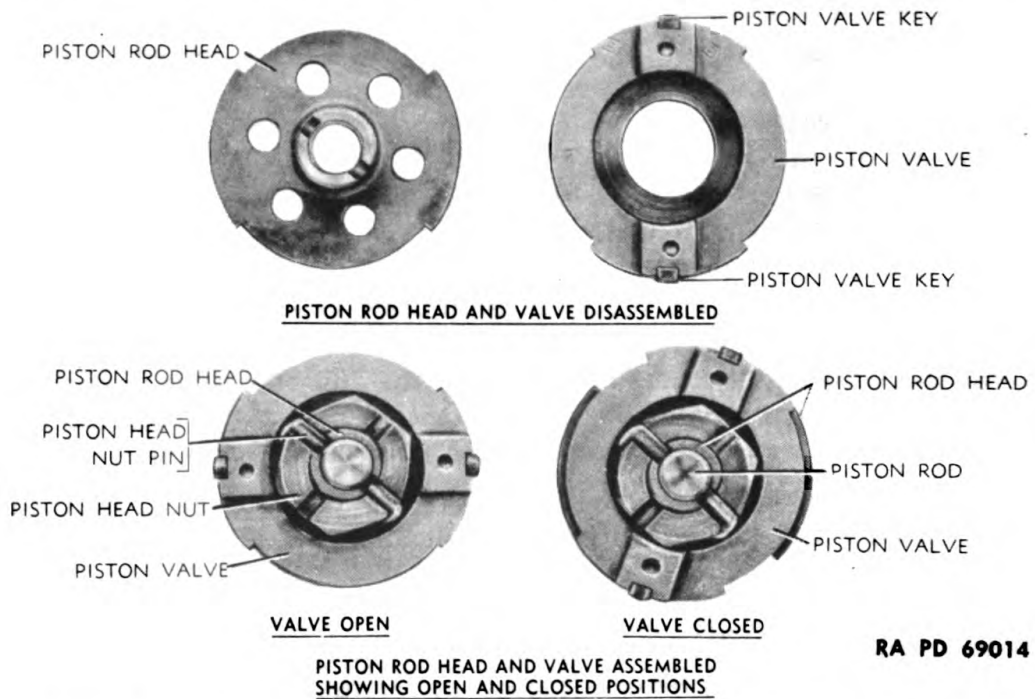
### 37. OIL BUFFER ADJUSTMENT.

a. General.

(1) The function of the oil buffer, as described in paragraph 17, is to cushion the recoil of the barrel extension and barrel, stop the parts, and return them to battery in conjunction with the action of the bolt on the accelerator. As the recoil and counterrecoil force of the buffer spring and driving springs are constant, the only adjustment of these forces is by the regulation of the oil resistance to the piston rod head in the oil buffer tube, by increasing or decreasing the



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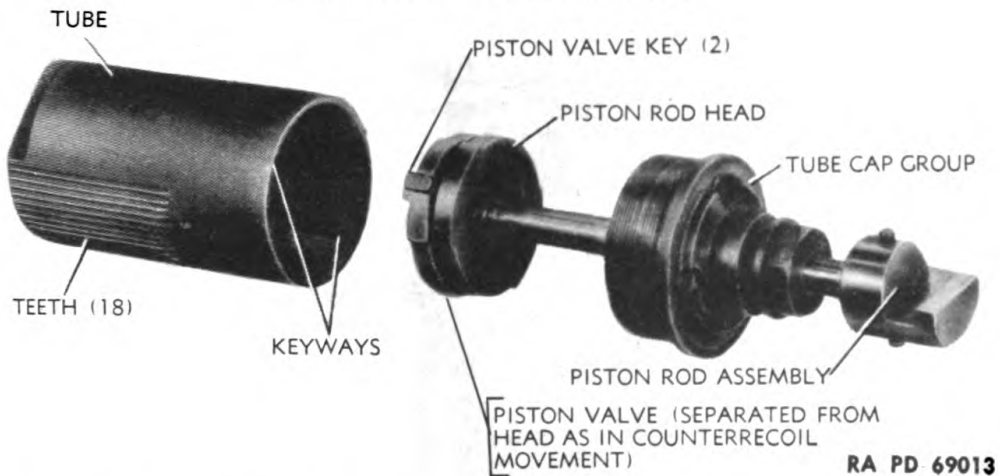


**Figure 28 — Oil Buffer Piston Rod Head and Valve Disassembled and Assembled, Showing Oil Relief Ports and Positioning**

rate of flow of the oil through the throttling ports in the piston rod head by adjustment of the valve. A change in the rate of flow of the oil will influence the rate of reciprocation of the recoiling parts and hence the firing speed of the gun. Hence the proper adjustment of the oil buffer is an important factor in the proper functioning of the gun.

(2) The piston valve has a cutaway sector on opposite sides of its periphery which mate with similar cutaway sectors on the piston rod head (fig. 28). As the valve turns, these openings coincide or are closed by the uncut portion of the periphery. Thus the openings, or so called relief ports, are opened or closed according to how far the valve is turned. Six additional holes are drilled in the piston head, and the diameter of the hole in the valve through which the stem of the piston head passes is greater than the diameter of stem, also clearance is provided between valve and rod head when assembled, thus allowing additional space for the flow of oil when they are separated. As the piston head is driven backward on the recoil movement (fig. 11), the resistance of the oil presses the valve against the head, thus closing all openings except those of the periphery of valve and head. On the counterrecoil stroke (fig. 15), the valve is forced away from the head by the oil resistance and hence the additional openings are exposed and oil can pass through more quickly than during the recoil movement.

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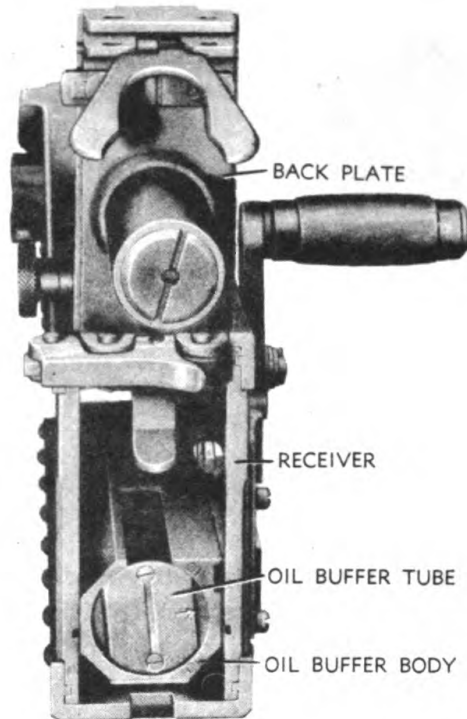


**Figure 29 — Oil Buffer Assembly Partly Disassembled, Showing Valve Keys and Keyways in Tube**

(3) The oil buffer piston rod, to which the head is screwed, is prevented from turning by a key in the oil buffer spring guide engaging in a longitudinal slot in the oil buffer body when assembled, as well as by its engagement with the barrel extension shank, when assembled. The valve is keyed to the inside of the buffer tube but can turn on the piston head stem on which it seats (fig. 29). Hence the valve turns when the tube is turned, thereby opening or closing the throttling ports cut in the periphery of the piston rod head as explained. The tube is turned, for adjustment, by inserting a screwdriver through the hole in the lower end of the back plate and engaging it in the slot in the rear end of the tube. The tube is held in position with respect to the oil buffer body by the nose of the tube lock, seated in the body, engaging in teeth cut in the tube. There are 18 teeth in all for adjustment, and this range is indicated by a sector on the body at the extremes of which a "C" and an "O" are stamped (fig. 30). An arrow stamped on the base of the tube indicates the setting of the tube when assembled. Thus, if the arrow points half-way between "C" and "O", the oil ports in valve and head are half open, etc.

(4) When temperatures are high, and the gun heated, as after considerable firing, the buffer oil will become less viscous or thinner, and will therefore pass more easily through the throttling ports in the piston rod head and offer less resistance to recoil and counterrecoil of the recoiling parts, and the speed of firing of the gun will therefore increase. This speed of firing may increase to the point whereat the gun will not function properly, which will result in a slamming of the recoiling parts. (Such slamming, however, should not be confused with the slamming of the bolt against the back plate due to improper adjustment of the buffer disks in the back plate.) In such a case, the flow of oil through the throttling ports in the piston rod

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**Figure 30 — Rear End of Receiver With Back Plate Raised, Showing Rear End of Oil Buffer Group**

head should be cut down to the point where the gun will properly function at the rate of fire desired, by turning the buffer tube *clockwise* the necessary number of clicks. Such adjustment should be made gradually.

(5) If on the other hand the flow of oil through the throttling ports is too slow due to too much restriction or an increased viscosity of the oil due to low temperatures, the rate of fire will be decreased due to the added resistance. This resistance may reach the point at which the recoiling parts will not recoil sufficiently to produce proper functioning of the gun, and result in a cessation of fire or stoppage of the gun. In this case the valve must be adjusted with relation to the throttling ports in the piston head to increase the flow of oil by uncovering the ports the proper amount. This adjustment is made by turning the oil buffer tube and valve *counterclockwise*, to open the ports, until the gun functions properly and smoothly at the desired rate of fire. Such adjustment, however, should not be made, until it is certain that the stoppage is due to the maladjustment of the oil buffer and not other causes such as tight front or rear barrel packing or insufficient headspace. The gun is apt to function sluggishly until warmed up, especially in low temperatures.

(6) It has been found that light recoil oil is best suited as a re-

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coil oil under all conditions. Oil buffers of guns now issued are filled with this oil. If it is not known that this oil is present in the buffer, it should be drained and refilled with this oil (par. 36).

### **h. Initial Setting of the Buffer.**

(1) There is no fixed point at which the buffer can be set to insure proper functioning of the gun under all conditions, as the force of recoil and counterrecoil will vary due to several factors such as the ammunition used, angle of fire, tightness of barrel packing, friction of recoiling parts, and viscosity of the oil due to temperature or oil used. Such a setting must therefore be determined by trial and error and adjusted for the gun in question until it functions smoothly at the desired rate of fire. A starting point, however, must be determined and this can be done with the oil buffer assembled in the gun and the back plate partly raised as shown in figure 30, or locked in place. If the setting of the buffer for the gun in question is known (noted when disassembling) it should be taken as the initial setting and further adjustment made only if necessary.

(2) To set the buffer for the initial setting, with the back plate raised, turn the buffer tube until the arrow stamped on the rear end points at a point one-third the distance between the "C" and "O" stamped on the right side of the rear end of the oil buffer body; this should place the tube lock in the sixth tooth in the tube from the fully closed position (there are 18 teeth in all). The setting may be made without lifting the back plate as follows:

(a) Insert a screwdriver through the hole in the lower end of the back plate and engage it with the slot in the rear end of the buffer tube.

(b) Turn the buffer tube to the *right* (clockwise) until the tube lock fails to engage any of the teeth in the tube.

(c) Turn the tube to the *left* (counterclockwise) 6 clicks (there are 18 in all), which will be heard and felt as the tube lock engages the teeth. This will place the arrow as in subparagraph *b* (2) above.

**NOTE:** Oil buffer tube locks of recent design make it necessary to withdraw the oil buffer group part way from the receiver for adjustment.

(3) From this point, the tube may be turned to the *right* (clockwise) towards the "C" stamped on the oil buffer body, to close the throttling ports and thus increase absorption of recoil to slow down the rate of fire of the gun, or to the *left* (counterclockwise) towards the "O" stamped on the body, to open the throttling ports and increase the rate of fire of the gun. If the gun slams or fires too fast, the tube should be turned to the *right* (clockwise), and if the gun fires too slowly or fails to function due to lack of sufficient recoil of the recoiling parts, the tube should be turned to the *left* (counter-

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clockwise). Adjustment should be made gradually, a click or two at a time, and final adjustment determined when the gun is warmed up. When once determined for the gun in question, little or no adjustment should be necessary. When starting a cold gun, allowance should be made for warming up of the gun before any adjustment is made, unless malfunctioning or slamming is evident.

(4) When the gun is used for continuous high-angle fire, the oil buffer valve may have to be closed slightly more than for level fire to offset the pull of gravity on the gun during recoil. For antiaircraft use, the gun should be adjusted to fire at as high a rate of speed as is consistent with proper functioning on account of the air speed of the aircraft fired at.

**38. PRECAUTIONS TO BE OBSERVED DURING COLD WEATHER.****a. Antifreeze Mixtures in Water Jacket.**

(1) During cold weather, it is necessary to guard against freezing of the water in the water jacket and circulating system of the gun. In locations where the atmospheric temperature is below 32 F, it is necessary to have antifreeze mixture available for use in the water jacket which will not freeze nor gum and yet will cool the barrel.

(2) COMPOUND, antifreeze (ethylene glycol type), is authorized for use in water jackets for machine guns for cold climates. It is satisfactory for temperatures as low as minus 60 F, when mixed with water in the proper proportions. It is highly important that the proper proportions of antifreeze compound and water be *maintained*. Protection against freezing at temperatures as low as minus 62 F, can be obtained with a mixture consisting of 60 percent by volume of antifreeze compound and 40 percent by volume of water.

(3) When the antifreeze compound and water mixture is used, it should be mixed in a container and then poured into the water jacket of the gun and the water chest to insure proper proportions and a thorough mixing of the ingredients. The strength of the solution is determined by its specific gravity, as tested by means of a hydrometer.

(4) If a mixing container is not available, the antifreeze compound can be poured directly into the water chest and water jacket, and water then added to the chest and water jacket until full. If this method is used, the proper amount of antifreeze compound should be computed to produce a mixture of the required strength, so that when water is added the mixture will be correct. Cold water should not be poured into a cold chest or water jacket first, as freezing may take place before the antifreeze compound can be added. (Likewise cold water should not be poured into a hot jacket as it might crack the parts.) In this case, the mixture should be thoroughly

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mixed at once by circulating the ingredients for a few moments by means of the crank on the water chest. If such mixing is not thoroughly accomplished the water in the mixture in chest or jacket may freeze due to lack of strength unless the gun is fired immediately and sufficiently to heat the water until mixing is complete. The crank on the water chest should always be turned in a clockwise direction as indicated by the arrow stamped on the crank cover of the chest. Method of filling water jacket and chest is described in paragraph 112 b (1) (c). Capacities of water chests and water jackets are as follows:

Water chest, cal. .50, M3 .....	8 gal
Water chest, cal. .50, M2 .....	7 gal
Water jacket for 36-inch barrel .....	8 qt
Water jacket for 45-inch barrel .....	10 qt

(5) In an emergency, when a suitable antifreeze solution is not available, OIL, engine, SAE 10, or used crankcase oil may be used in the water jacket of the gun. No circulating unit should be used in this case and the jacket should not be entirely filled, to allow for expansion. The (inlet) small union cap should be screwed on the small hose connection bushing on the jacket in place of the hose, and the outlet hose allowed to remain connected. This hose should then be stretched along the jacket and fastened at the muzzle end. By so doing, the oil will not be lost when the gun is elevated for high-angle fire. (Either hose will serve in an emergency.) This mixture cannot be used satisfactorily where the temperature is in excess of 32 F. After the use of engine oil or engine crankcase "drainings" the water jacket should be disassembled and jacket, bearings, steam tube, and hose thoroughly cleaned out with dry-cleaning solvent or Diesel fuel, and bearings then lightly lubricated, before water or other cooling mixtures are used. If the oil gets into the circulating system, it will attack the rubber hose and clog the pump.

### b. Oiling and Lubrication.

(1) Oiling and lubrication should be kept at a minimum in low temperatures, and the gun and mount manually operated frequently to see that they function properly.

(2) During cold weather when the gun is not in use, the movable parts in the gun and the trigger control mechanism of the mounts should be kept free of excess oil. Clean thoroughly with dry-cleaning solvent; then dry and oil parts lightly, wiping the excess oil off with a clean dry wiping cloth. Before firing the gun, the moving parts should be lightly oiled at contacting points.

(3) Full explanation of the care and lubrication of materiel in cold and hot climates and under unusual conditions is contained in section XIV.

**CAUTION:** If it is necessary in an emergency to fire the gun with

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water in the jacket only, and without the circulating system, the (inlet) small union cap must be screwed on the small hose connection bushing, and the outlet hose used as in subparagraph a (5) above. A hot barrel is often indicated by an excessive muzzle blast.

**39. PRECAUTIONS TO BE OBSERVED DURING GAS ATTACK, AND DECONTAMINATION.**

a. Precautions to be observed during gas attack, general decontamination, and cleaning of materiel affected by chemicals is contained in FM 21-40 and TM 3-220 listed in the references section XVI of this manual.

**40. POINTS TO BE OBSERVED BEFORE, DURING, AND AFTER FIRING.**

a. The following list of points to be observed before, during, and after firing will be found useful as a guide for proper care of the gun and mounts. It will also serve as a guide for inspection.

**b. Before Firing.**

(1) See that the bore and chamber are clear and clean, and free of all oil and grease.

(2) Check front and rear barrel packing for leakage or binding with barrel, and if necessary adjust. See that drain valve is tightly closed and not leaking.

(3) Check headspace adjustment.

(4) Be sure that oil buffer tube is filled with oil and, where applicable, properly adjust.

(5) See that adjusting screw is tight against buffer disks in back plate, and back plate latched and locked.

(6) See that sight brackets (M2 Mount) and antiaircraft sights (M2A1 and M3 Mounts) are firmly clamped in place and that sights are clear and clean, and that sight control equipment (M2 Mount) is properly connected. If combination rear gun sight is used, set elevation at 700 and windage at "0." Fold flat if not in use.

(7) See that water jacket and water chest are full, properly connected, hoses in good condition, and that pump works properly.

(8) See that working parts of gun and mount are clean, properly lubricated, and function properly, and that worn or broken parts are replaced.

(9) See that gun mount is clean, properly lubricated, firmly positioned, and adjusted, and that trigger control mechanism is secure, aligned, and functions properly.

(10) See that gun is firmly clamped in the mount with joint pin fully seated (M2 and M2A1 Mounts), gun securing pins locked (M3 Mount), and that gun can be freely elevated and traversed.

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(11) See that ammunition belts are in good condition and properly loaded, and inspect ammunition.

(12) See that ammunition chest tray and metallic link chute are firmly attached in alined position, and *double loop* of belt is leading.

(13) See that a sufficient supply of ammunition is handy.

(14) See that spare parts and tools are present, complete and in good condition, and that oiler is filled.

(15) Check from last firing to see that repairs have been made.

(16) Set hand trigger (gun), and hand lever of trigger control mechanism (M2 and M2A1 Mounts) or trigger lock (M3 Mount) at "SAFE" and load gun partly or completely as directed, making sure that the double loop end of the belt leads.

### c. During Firing.

(1) Observe functioning of gun to anticipate failures and lubricate working parts when necessary. Excessive muzzle blast indicates overheating of barrel, and smoking of operating mechanism indicates overlubrication. When barrel becomes overheated, change as soon as practicable. (For changing barrels refer to paragraph 66, and for check of new barrel refer to paragraph 25a (10) (b) 3.).

(2) Watch barrel packing and water connections for leakage, and keep water jacket and chest full.

(3) Check and tighten headspace if several separated cartridge cases occur, and inspect chamber and bore for obstructions.

(4) Keep belt in line with feed opening, watch metallic link chute for jamming, and see that link bag does not become too full.

(5) Keep mount firmly set in position with all clamps properly adjusted.

(6) If combination rear gun sight is used, keep in proper adjustment.

(7) During temporary cessation of firing unload the gun, or place firing mechanism at "SAFE" as directed. Before leaving the gun, fully unload, set firing mechanism at "SAFE," and secure cradle.

### d. During Temporary Cessation of Firing.

(1) Unload gun and clean bore as explained in paragraph 30 d.

(2) Check and tighten barrel packing if necessary.

(3) Check operating mechanism, lubricate if necessary, and clean dirt from under belt holding pawl.

(4) Empty belt link bag.

(5) Check gun and circulating system for leakage.

(6) Fill water jacket and water chest if necessary.

(7) Replace ammunition belt with full one if necessary.



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- (8) Make necessary repairs and replace broken parts.
- (9) Check mount and security of gun in mount.
- (10) Lubricate recoil mechanism slide (M2 and M2A1 Mounts) if necessary. (Slide should be lubricated every 2 hours while firing, oftener if necessary.)
- (11) Check spare ammunition.
- (12) Check setting of combination rear sight if used.
- (13) Refill oiler.
- (14) Note performance of gun on gun report.

**e. After Firing.**

- (1) Completely unload gun, and check chamber and T-slot.
- (2) Remove groups from gun daily, clean and oil parts carefully to prevent rust, according to the temperature, without dismounting gun, unless so directed. Inspect, clean, and oil bore each day, making certain that all signs of fouling have been eliminated.
- (3) When groups have been replaced in the gun, adjust, and check headspace and operation to insure that functioning and adjustments are correct, and lubricate gun according to climate.
- (4) Release firing pin by pressing hand trigger or trigger control lever on the mount.
- (5) Examine and adjust or replace packing if necessary and check circulating system for leaks. (Check headspace after adjusting or replacing packing.)
- (6) If muddy or dirty water has been used in the circulating system, drain and flush thoroughly.
- (7) Check movement of steam tube and if not free, remove and clean. (Steam tube in water jackets (45-inch barrels) of recent manufacture does not slide and cannot be removed (par. 7 f).)
- (8) At earliest opportunity dismount gun, clean, oil, and inspect all parts. Make needed repairs and replacements.
- (9) Determine cause of stoppages and correct immediately.
- (10) Replenish ammunition and spare parts, and clean out ammunition chest.
- (11) Set gun sight (if used) at 700 elevation and "0" windage, and fold down.
- (12) Clean, oil, lubricate, and check mounts.
- (13) Lock cradle at zero elevation.
- (14) Complete gun record.
- (15) Cover gun and mount when not in use.

## Section VI

# DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

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## 41. GENERAL.

a. Disassembly and assembly as covered in this manual, comprise two general classifications: first, removal and reinstallation of groups to the extent required for adjustment, ordinary cleaning, and minor repairs; second, detailed disassembly and assembly, involving removing and reinstallation of all components from each group.

b. A group is a number of parts or assemblies or both, which either function together in the gun or are intimately related to each other and which should, therefore, be considered together.

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c. Removal of the groups from the gun may be accomplished with the aid of the bullet end of a cartridge. Complete disassembly may be accomplished with the tools provided, as indicated in paragraph 42.

d. Place disassembled parts on a clean flat surface, and guard against loss of pins, springs, and other small parts.

e. As an aid to assembly, carefully note the position of parts and assemblies before disassembly, and the manner in which they are removed.

f. Although disassembly of the gun is covered in detail herein, only such parts or groups should be disassembled as are necessary for cleaning, adjustment, and repair within the scope of the using arms.

g. Detailed assembly of the group parts as described herein applies to a gun assembled for left-hand feeding, with side plate trigger positioned on the left side of the gun, and retracting slide on the right side. As this gun must be so assembled when used with the mounts covered herein, assembly for right-hand feed is not covered although positioning of parts concerned is explained for identification (par. 68).

h. When assembling the gun, take care to insert pins properly, seat springs, reinstall and spread cotter pins, and stake screws where prescribed. Damaged or broken parts, cotter pins, or locking wires should be replaced by new ones when assembling.

i. Before assembling, clean all parts thoroughly and oil *lightly*. When assembled, operate gun, check thoroughly for proper functioning, and adjust and check headspace as prescribed in paragraphs 45 and 46.

j. Groups should be removed from and reinstalled in the gun, and component parts of the groups disassembled and assembled in the order given herein.

k. Before attempting to disassemble or assemble a group or assembly, the complete instructions pertaining to it should be read, including notes and cautions.

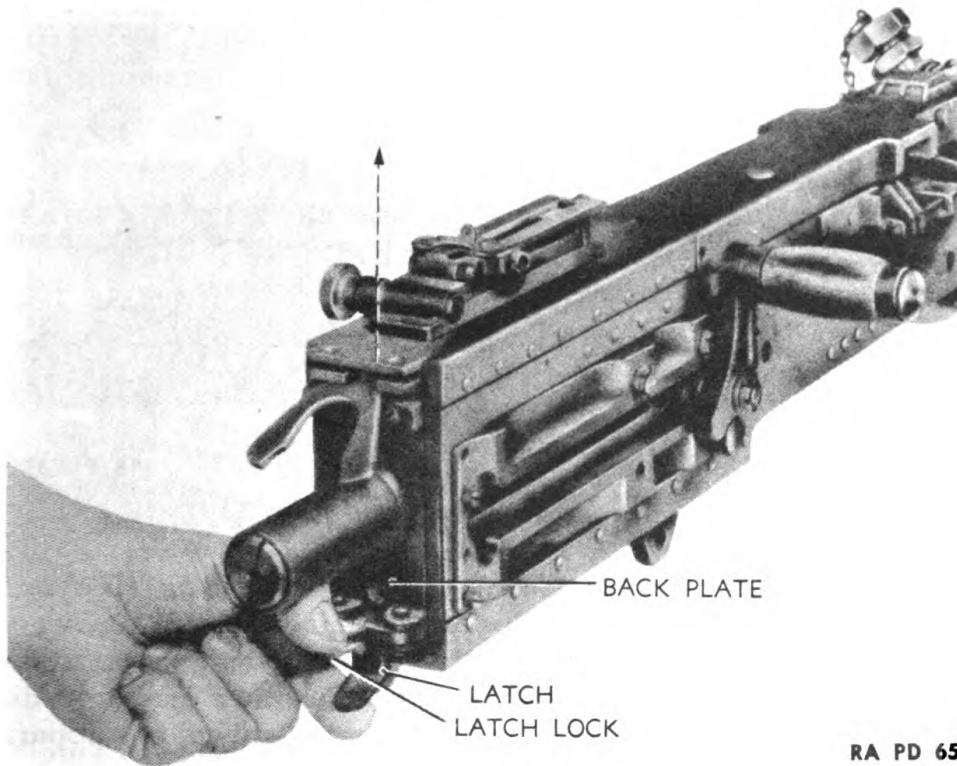
**42. TOOLS FOR DISASSEMBLY AND ASSEMBLY.**

a. The groups may be removed from the gun by using the bullet end of a cartridge if no other tools are available. Other tools necessary for complete disassembly of the groups as far as lies within the scope of the using arms are listed in SNL A-37, and described in section XIII.

**43. REMOVAL OF GROUPS FROM THE GUN.**

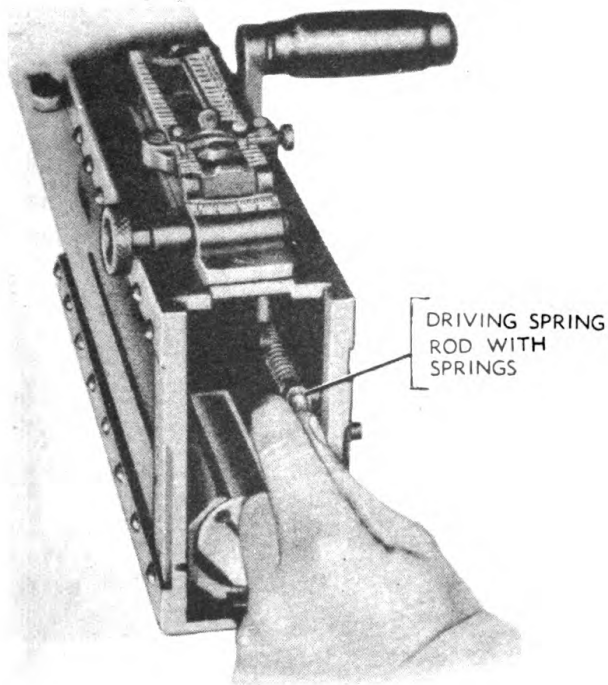
a. Unlatch and raise the cover, retract the bolt, and examine barrel chamber and T-slot, to make sure gun is fully unloaded. Then, allow the breach bolt to move fully forward and release the firing pin by operating the hand trigger or side plate trigger. Then, drain the water

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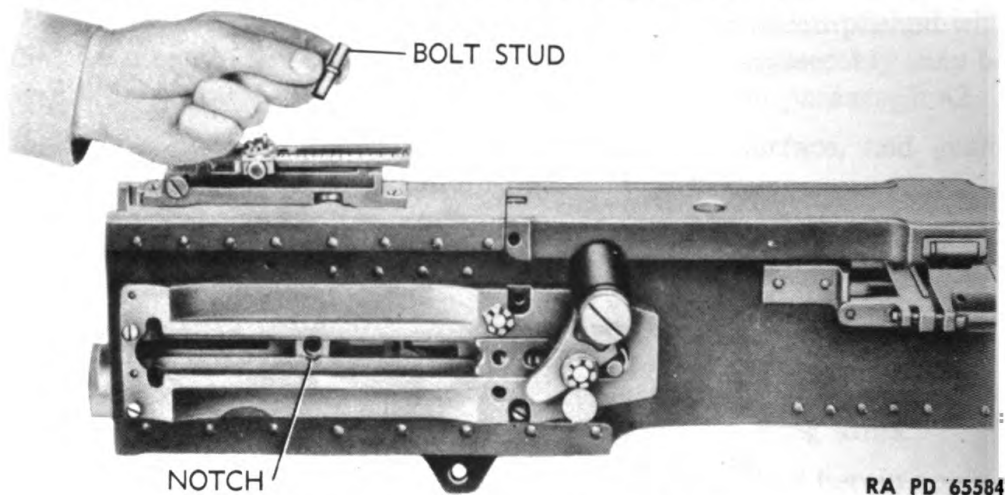
*Figure 31 — Disengaging Back Plate Latch Lock and Latch Preparatory to Removal of Back Plate*



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*Figure 32 — Removing Driving Spring Rod Group*

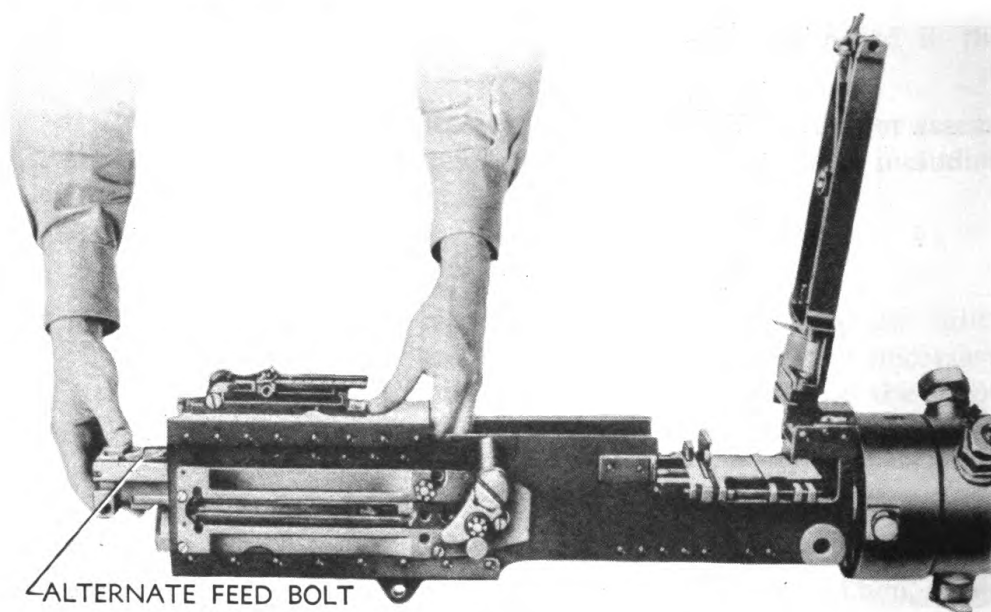
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**Figure 33 — Removing Bolt Stud from Bolt**

jacket of the gun by removing the intake water hose, or cap (if assembled) and opening the drain valve in the under side of the water jacket. Tip muzzle of gun up slightly to insure thorough draining. Groups may be removed without draining the water jacket or dismounting the gun by following procedure prescribed in subparagraph d (4) below.

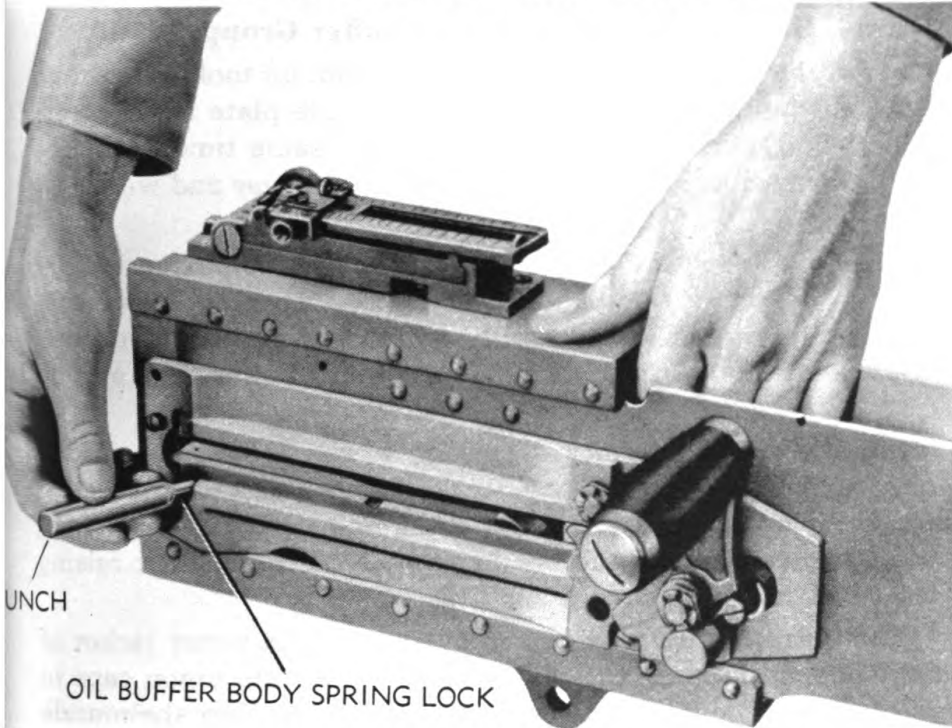
**b. Back Plate Group.** Unlock the back plate latch and disengage it by pressing out on the lock and up on the latch as shown in figure 31; then, holding the latch and lock disengaged, pull the back plate up and out of the receiver.



**Figure 34 — Removing Bolt Group**

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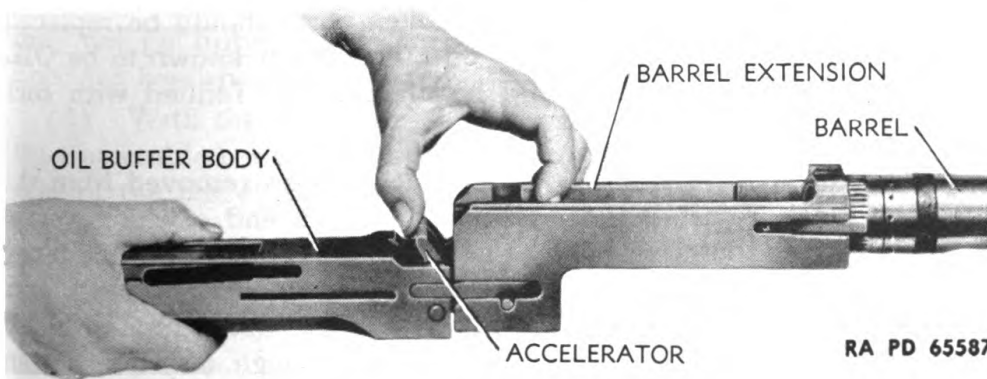
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**Figure 35 — Releasing Oil Buffer Body by Depressing Spring Lock**

**c. Bolt Group.**

(1) Move the rear end of the driving spring rod about  $\frac{3}{8}$  inch to the left to disengage the retaining pin from the hole in the right-hand side plate of the receiver, and withdraw the rod and springs to the rear out of the bolt (fig. 32).

(2) Pull the bolt to the rear by means of the retracting slide, until the bolt stud alines with the clearance hole in the bolt slot in the right-hand side plate (fig. 33). Pull out the bolt stud and slide the bolt to the rear out of the receiver (fig. 34).



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**Figure 36 — Removing Oil Buffer Group from Barrel Extension**

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**d. Barrel, Barrel Extension, and Oil Buffer Groups.**

(1) Insert the point of a bullet, a punch, or similar tool in the small hole in the rear lower corner of the right-hand side plate and depress the oil buffer body spring lock (fig. 35). At the same time, push the barrel, barrel extension, and oil buffer groups to the rear and withdraw from the casing.

(2) Detach the oil buffer group from the barrel extension by pushing forward on the tips of the accelerator (fig. 36). The barrel and barrel extension need not be fully withdrawn from the receiver to remove the oil buffer group. Note setting of oil buffer tube and do not disturb unless necessary.

(3) Pry up the barrel locking spring from the notches in the barrel only sufficiently to disengage it, and then unscrew the barrel from the barrel extension by turning counterclockwise. The locking spring will cam itself out of the notches in the barrel without raising it, but wear is saved by raising it slightly.

(4) The barrel group may be removed from the water jacket of the casing without draining the jacket by screwing the union caps to inlet and outlet openings of the water jacket and lowering the muzzle of the gun to prevent loss of water at the breech end. Then, hold a tapered plug of the proper size to the muzzle end of the barrel and withdraw oil buffer, barrel extension, and barrel groups to the rear. As the barrel is withdrawn, follow it with the plug, and insert plug firmly in hole in the muzzle gland through which the barrel has been withdrawn. For details and reinstallation, refer to paragraph 66 f.

**e. Cover Group.** The cover need not be removed when removing the other groups. To remove, close cover, withdraw cotter pin from the cover pin, and pull cover pin from the receiver. Then, rotate cover upward and forward, and remove from the trunnion block.

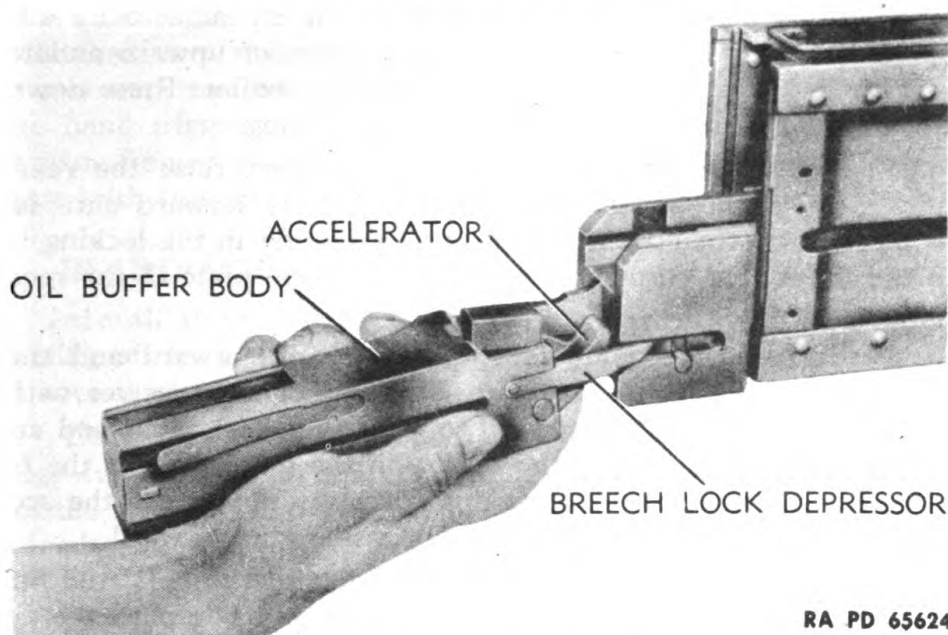
**44. REINSTALLATION OF GROUPS IN THE GUN.**

**a.** Before reinstalling the groups in the casing, inspect, clean, and lightly oil the parts. Badly worn or broken parts should be replaced. If the specification of the oil in the oil buffer is not known to be OIL, recoil, light, the oil buffer should be drained and refilled with such oil (pars. 36 and 51 e (2) ).

**b. Cover Group.** If the cover group has been removed from the trunnion block, reinstall it by placing the latch end of the cover in position with the latch engaging the top plate. Then, force the hinge end downward into position depressing the cover detent pawl, and, using a pin drift, aline the pinholes in the cover and trunnion block. Insert the cover pin from the right side, push through, insert cotter pin and spread prongs around pin. The cover should *not* be a loose fit on the trunnion block when assembled.



# DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN



RA PD 65624

**Figure 37 — Attaching Oil Buffer Group to Barrel Extension**

## c. Barrel, Barrel Extension, and Oil Buffer Groups.

(1) Screw the barrel into the barrel extension all the way. The barrel should be headspaced *after* the gun has been completely assembled as prescribed in paragraph 45.

**NOTE:** The nose of the locking spring will ordinarily be cammed out of the notches in the barrel as it is turned, but to save wear of the spring and notches, lift the spring only sufficiently to clear the notches while turning. Do not strain the spring. When screwed all the way into the barrel extension, the rear face of the barrel should extend slightly beyond the rear face of the front end of the extension. If it does not, the barrel should be replaced with a new one that does; otherwise headspace adjustment cannot be properly determined. With the barrel screwed all the way in, the recoiling parts may not go fully forward into battery, when the gun is assembled, until the headspace is adjusted (**NOTE**, subpar. f below).

(2) With the cover raised, insert the barrel and barrel extension thus assembled into the receiver until the lower projection on the rear of the barrel extension strikes the bottom plate of the receiver (fig. 37).

(3) Grasp the oil buffer group in the right hand with the index finger holding up the accelerator. With the rear end of the oil buffer body slightly depressed, start the breech lock depressors, on the front end of the oil buffer body, into the guideways of the barrel extension (fig. 37). Then raise the rear end of the oil buffer body to a horizontal position making sure that the piston rod and barrel



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extension shank engage each other. Push the oil buffer body forward as far as it will go thus rotating the accelerator upward and to the rear to lock the barrel extension to the oil buffer. Press down the tips of the accelerator to insure complete locking.

(4) With the groups thus locked together, raise the rear end until clear of the bottom plate and push fully forward until locked in position by the oil buffer spring lock seating in the locking recess in the lower rear corner of the right-hand side plate of the receiver.

**d. Bolt Group.**

(1) With the cocking lever pushed fully forward and the extractor down, insert the bolt into the rear of the receiver with the front end tipped slightly upward to clear the accelerator, and engage the guides on the sides of the bolt with the guideways in the barrel extension. Observe care during this operation not to trip the accelerator or the barrel and barrel extension will spring forward.

(2) Level the bolt and push forward until the bolt stud hole in the bolt and the clearance hole in the right-hand side plate are alined. Then, insert the bolt stud so that the collar on the stud lies inside the side plate.

(3) Insert the driving spring rod group into its tunnel in the bolt, and push the bolt fully forward by pressing on the rear end of the bolt (not the rod). This will trip the accelerator and cause the barrel and barrel extension to spring forward into battery. Observe care that the fingers are not in the top opening of the receiver when the bolt is pushed forward.

(4) Push the driving spring rod forward and engage the retaining pin in the rear end of the rod in the retaining hole in the rear end of the right-hand side plate.

(5) If setting of the oil buffer is not known, adjust as explained in paragraph 37.

**e. Back Plate Group.** Insert the back plate, latch end down, into the top of the rear end of the receiver so that guides and guideways engage. Then, pull out on the latch lock to disengage it from the latch, and push the back plate down until the latch clicks into position. Then, release the latch lock, and check to see that locking is secure.

**f.** Adjust the headspace of the gun as prescribed in paragraph 45, and then check headspace as prescribed in paragraph 46.

**NOTE:** The recoiling parts will not go fully forward into battery with the barrel screwed all the way into the barrel extension. Therefore, no attempt should be made to operate the gun until headspace is adjusted. In the case of a new barrel or where the packing has been replaced or adjusted, the barrel should be unscrewed eight notches to allow recoiling parts to go fully into battery to make sure packing does not bind, before adjusting headspace.

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

g. With the gun thus fully assembled and headspaced, and the cover latched, test the action by pulling the retracting slide fully to the rear and then releasing. Then, release the firing pin by pressing the hand trigger, side plate trigger, or sear slide to test firing mechanism. Repeat this a few times to see that the parts work freely. Test gun with dummy cartridges if available.

### 45. HEADSPACE.

a. **General.** Proper headspace adjustment is vital to the proper functioning of the gun, and an understanding of its importance and significance is essential for personnel concerned.

(1) **DEFINITION.** The headspace of a military weapon with the cartridge fully seated in the chamber is the distance between the base of the cartridge and the face of the bolt. In Browning machine guns, headspace is adjusted by obtaining the proper distance between forward part of bolt and rear end of barrel.

(2) **SIGNIFICANCE.** When any cartridge is fired, the powder gases exert tremendous pressure in the chamber. This pressure forces the bullet out of the barrel; it also tends to force the cartridge case out of the chamber. The cartridge case therefore must be held snugly in the chamber from the time the round is fired until the bullet leaves the barrel. It is held there by the forward face of the bolt pressing against the rear face of the cartridge, the bolt being locked in this position by the breech lock. The breech lock engages a recess in the bottom of the bolt and locks it firmly to the barrel extension. As the recoiling parts move into battery after recoil, the breech lock is forced upward by the breech lock cam and locks the bolt to the barrel extension just before they reach the battery position.

(3) **INSUFFICIENT HEADSPACE.** If the parts have been improperly adjusted with too little headspace, the bolt is held too far rearward by the barrel. This may cause:

(a) Failure of the recoiling parts to go completely into battery because the breech lock cannot fully enter the locking recess of the bolt.

(b) Failure to fire because the bolt may not go forward far enough for the sear to be released.

(c) Sluggish fire because of binding and excessive friction between the moving parts (particularly noticeable when pulling a long ammunition belt).

(4) **EXCESSIVE HEADSPACE.** Too much headspace may cause:

(a) Rupture or separation of the cartridge case because the bolt is not far enough forward to hold the cartridge snugly in the chamber.

(b) Inability to obtain proper timing.

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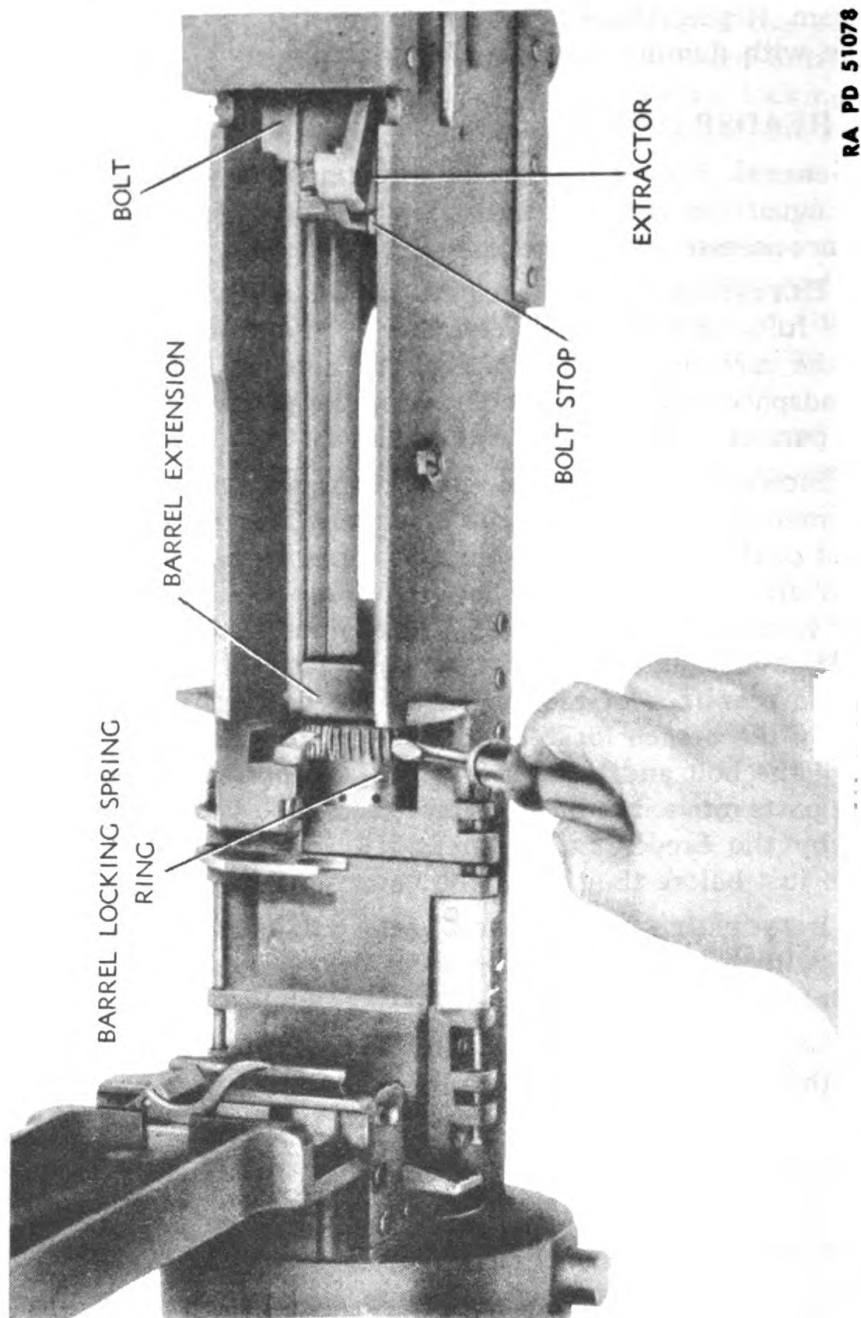


Figure 38 — Bolt Hung by Bolt Stop to Show Use of Screwdriver in Turning Barrel

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

(c) Poor shot patterns because of escape of powder pressure at the breech.

(d) Battering of the breech lock, bolt, and barrel extension because the locking surfaces of the breech lock and bolt recess are not in contact at the instant of firing. This will soon render these parts unfit for service.

(e) Battered T-slot lips due to the bolt striking the barrel extension.

b. **Adjustment.** Headspace must be adjusted each time the gun is assembled or the barrel packing is adjusted, or whenever headspace is in doubt. It should be checked and, if necessary, adjusted before firing the gun. Before attempting to adjust headspace be sure that the gun is completely unloaded, that there is no binding due to tight barrel packing, and that the threaded portion of the barrel is free from burs and is long enough to project slightly into the barrel extension when screwed all the way in. Adjustment must be made with gun fully assembled. To adjust:

- (1) Raise the cover and retract the bolt about  $\frac{1}{2}$  inch (no more).
- (2) Screw the barrel into the barrel extension (by applying a screwdriver to the notches on the rear end of the barrel) until the barrel comes into contact with the bolt.
- (3) Check to make sure end of barrel extends through barrel extension.
- (4) Then unscrew the barrel *two* notches.
- (5) If the gun operates sluggishly, unscrew barrel one additional notch.

**NOTE:** The right-hand rear cartridge stop may be removed to facilitate turning of barrel with the screwdriver during adjustment. Figure 38 shows bolt retracted and hung to show use of screwdriver in turning barrel. Bolt should *not* be hung when making headspace adjustment as prescribed above.

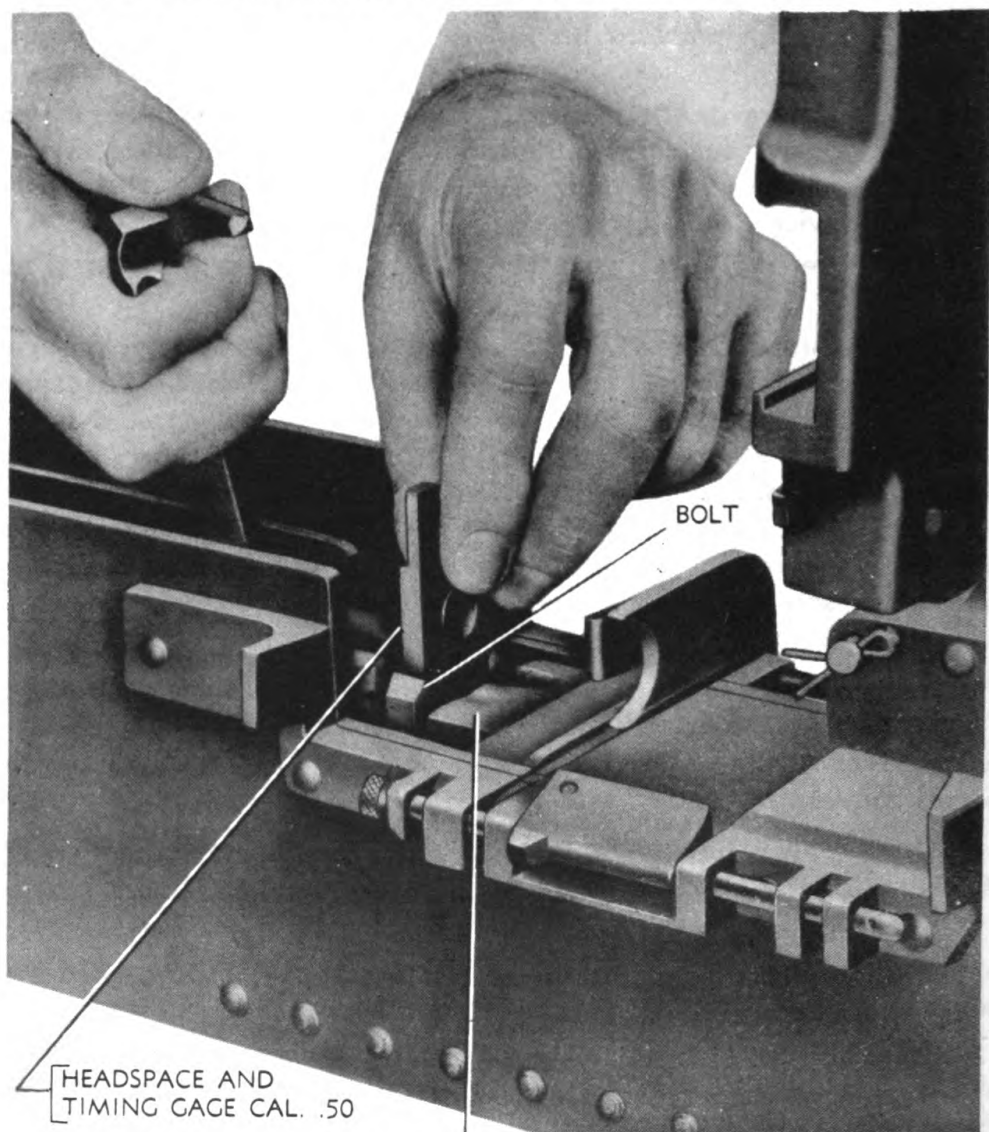
### 46. HEADSPACE CHECKING.

a. Headspace should be checked each time it is adjusted, before firing, during temporary discontinuance of firing, after adjustment of barrel packing, and whenever the adjustment is in doubt. Adjustment should be checked with the headspace and timing gage A196228.

b. **Checking Headspace Adjustment by Use of Headspace and Timing Gage A196228.** This combination gage provides a definite means for checking headspace adjustment. The portion of the gage to be used for checking headspace is marked "HEADSPACE 0.200." The following procedure should be followed in checking headspace:

- (1) After headspacing in the manner prescribed above, the barrel will protrude slightly beyond the inner face of the barrel extension.

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BARREL EXTENSION

RA PD 65625

**Figure 39 — Using Cal. .50 Headspace and Timing Gage A196228**

(2) Cock the firing pin by fully retracting the recoiling parts, and then allowing them to go fully forward into battery.

(3) Retract the bolt slightly (not more than  $\frac{1}{16}$  inch) in order to relieve the driving spring pressure between the bolt and the rear end of the barrel, and place the forward face of the breech lock and bolt in close contact as when firing.

(4) Then, insert the gage in the T-slot between the face of the bolt and the rear end of the barrel (fig. 39). If the gun is headspaced too tightly, it will not be possible to insert the gage. If such is the case, the barrel should be unscrewed, one notch at a time, until the gage will just enter the full depth of the T-slot without being forced.

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

**CAUTION:** Never release the firing pin while the gage is inserted in the T-slot or the pin will be damaged.

(5) If the gun has been headspaced in the prescribed manner, and if the headspace gage will just slide for its full length between the face of the bolt and the end of the barrel without being pushed downward, the headspace is correct. It must be clearly understood that the headspace gage is a "GO" gage which was designed particularly for the purpose of checking guns in installations when tight headspace would cause serious trouble.

(6) The gage, however, may be used to determine whether headspace is unnecessarily loose by screwing the barrel into the barrel extension, *one notch at a time*, until the gage will not enter, and then unscrewing the barrel *one notch* so the gage will enter properly.

### 47. BACK PLATE GROUP DISASSEMBLY (fig. 40).

#### a. Flexible Back Plate Without Spade Grips.

(1) Using the screwdriver blade of the combination wrench (cal. .50 M2, fig. 137) loosen the back plate adjusting screw by turning counterclockwise. When loosened, the screw may be removed with a large screwdriver. Observe care during removal not to lose the adjusting screw plunger and spring, seated in the screw, as they may fly out.

(2) Push out the buffer plate and buffer disks from the tube by pressing on the front end of the plate.

(3) Push out the back plate latch pin and remove the latch and spring; then remove the latch lock by pulling out the cotter pin and removing the lock pin. The latch lock spring can be removed if necessary by compressing the sides of the spring. (Spring of recent design is a leaf-type spring retained in the lock by the back plate latch lock spring pin passing through spring and lock. Pin is bent over at ends to hold in position.)

(4) Remove the lower filler piece by pulling out the cotter pins and removing the two filler piece pins.

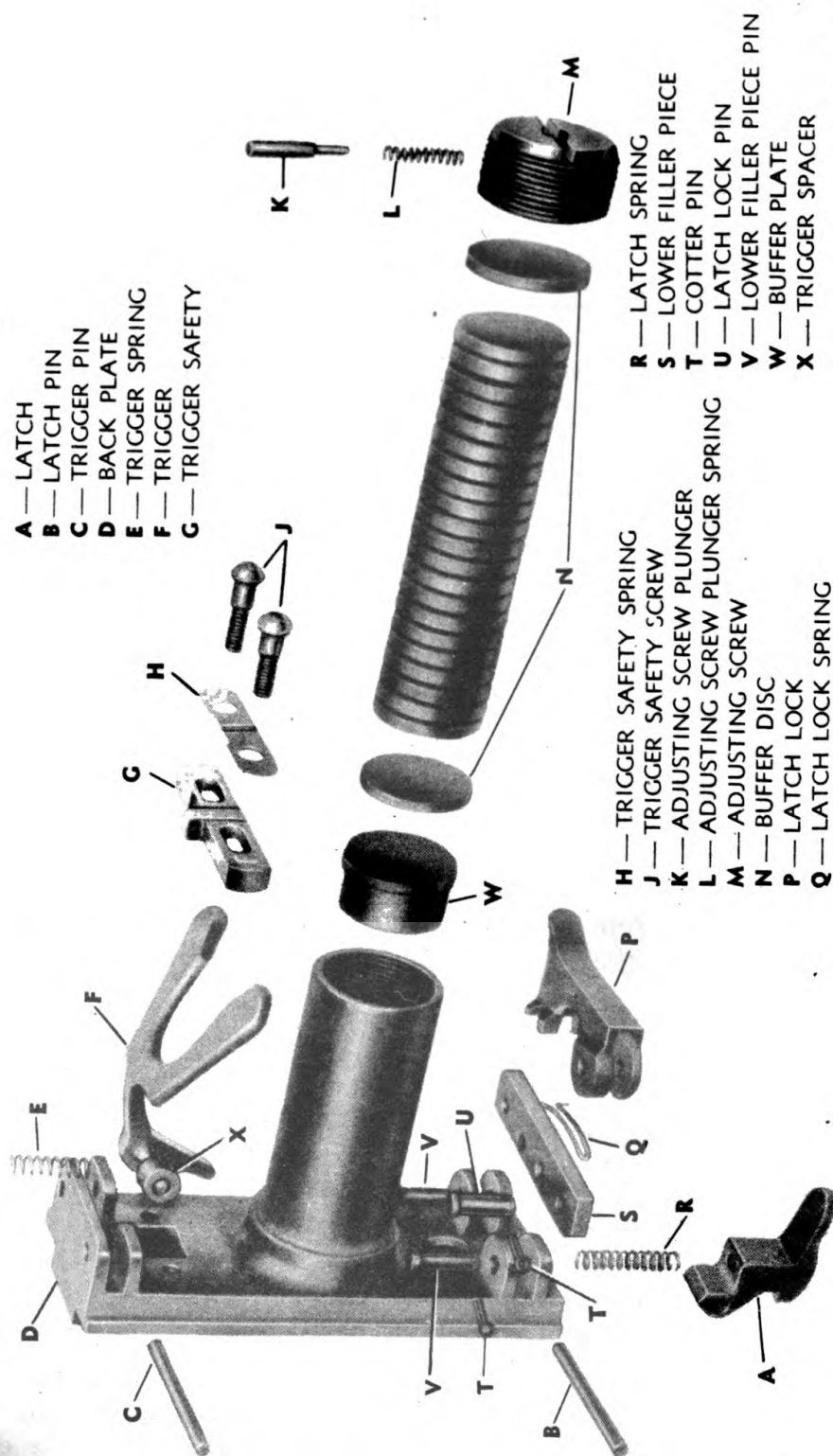
(5) Remove the trigger pin by starting it with a small punch and pulling it from the back plate with pliers.

(6) Remove the trigger spring and trigger spacer taking care not to lose the spring when the pin is removed, as it may fly out.

(7) Remove the trigger safety and spring by removing the two screws. The safety should not be disassembled unless necessary as the screws are staked in position. Safeties of recent design have a coiled spring in place of the flat one shown in figure 40.

**b. Flexible Back Plate With Spade Grips.** The disassembly of this back plate is the same as in subparagraph a above with the exception of the lower filler piece. The latch lock is assembled to the

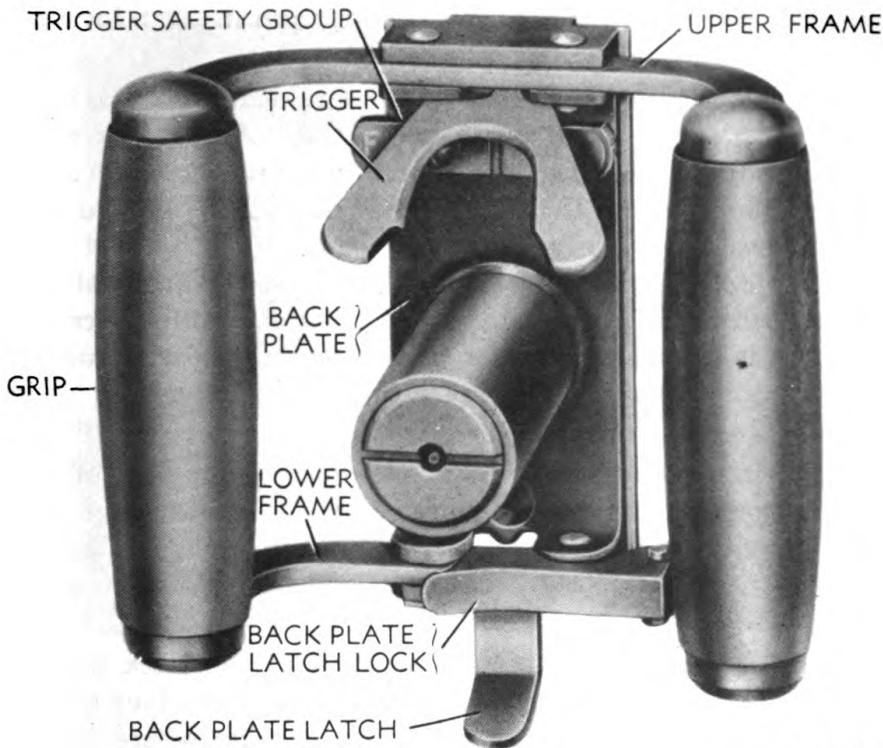
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RA PD 67574

Figure 40 — Back Plate Group Without Spade Grips — Exploded View

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN



RA PD 70830

**Figure 41 — Back Plate Group With Spade Grips**

lower handle frame which takes the place of the filler piece. The handle frames are riveted in place and should not be removed (fig. 41).

### 48. BACK PLATE GROUP ASSEMBLY (fig. 40).

#### a. Flexible Back Plate Without Spade Grips.

(1) Place the lower filler piece between the lower lugs on the back plate, with the extension to the *left*. Insert the two filler piece pins from the top, and insert cotter pins and spread prongs.

(2) Assemble the back plate latch by inserting the latch spring with one end in the recess in the latch and the other in the recess in the lower filler piece. Press the latch forward and insert the latch pin.

(3) If the latch lock spring has been removed, insert the latch lock spring in the lock with the bowed side of spring towards the lock and closed end towards the pin end of lock, and insert the free ends of the spring in the small holes in the latch lock. (Spring of recent design is a flat spring assembled by pushing the hooked end through the pin end of the lock so that the eye faces downward and bears on the filler piece when the lock is assembled. Spring is held in position by the back plate latch lock spring pin passing through spring and lock. Ends of pin are bent over to hold in position.)



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(4) Attach latch lock to lower filler piece by fitting lock to piece and inserting pin from the top. Insert cotter pin in latch lock pin and spread prongs.

(5) If the trigger safety has been removed, attach safety, with safety beneath spring (leaf-type), to the top of the back plate just above the tube, by threading the two screws through spring (leaf-type) safety, and plate, so that the "S" stamped on the safety is to the right. Tighten screws and stake in position from the front side of the plate. See that projection on spring (leaf-type) faces towards safety, so as to engage positioning grooves in safety when assembled. Screws must not be so tight that safety cannot be shifted, but tight enough to prevent accidental shifting. (The spiral safety spring of recent manufacture is assembled beneath the safety.)

(6) Insert the trigger into its aperture in the top rear of the back plate with the spacer to the *left* and the prongs of the trigger pointing downward. Seat spring in recess in trigger and back plate, align pinholes and push trigger pin through back plate, trigger, and spacer until flush with both sides of the back plate.

(7) Insert the buffer plate in the tube of the back plate, small diameter leading, so that it projects from the forward face of the back plate. Be sure tube is clean, especially on shoulder where recoil plate bears when assembled. The buffer plate should protrude approximately  $\frac{3}{16}$  inch from the front face of the back plate when assembled, and should not bind. Insert 22 buffer disks so that they seat properly one on the other.

(8) Thread the buffer adjusting screw into the rear end of the tube and screw in clockwise up to the plunger hole. Then, insert the plunger spring and plunger in the hole, depress the plunger, and screw the adjusting screw in against the buffer disks using the combination wrench to tighten the screw. If the adjusting screw extends from the rear end of the tube less than  $\frac{1}{16}$  inch after tightening, remove the screw and add one more disk and reinstall screw as above.

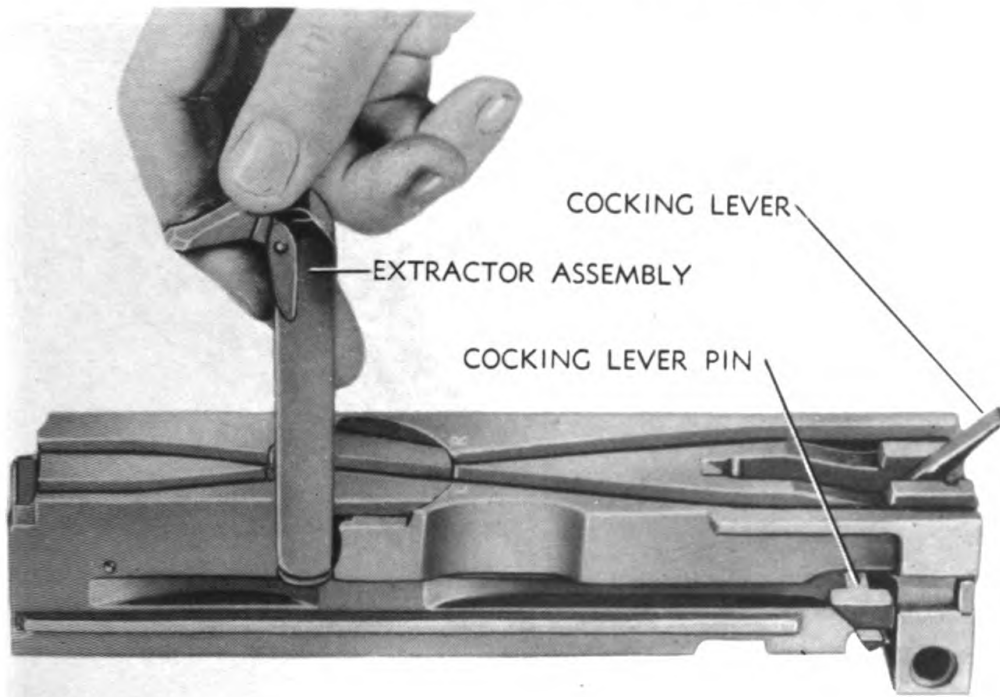
**NOTE:** The back plate latch lock is assembled to the left, as described above, for clearance with the retracting slide, which is assembled to the right side of the gun as used with the mounts covered herein.

b. **Flexible Back Plate With Spade Grips.** The assembly of this back plate is the same as in subparagraph a above with the exception of the lower filler piece. The latch lock is assembled to the right side of the lower handle frame and points to left (fig. 41).

**49. BOLT GROUP DISASSEMBLY (fig. 51).**

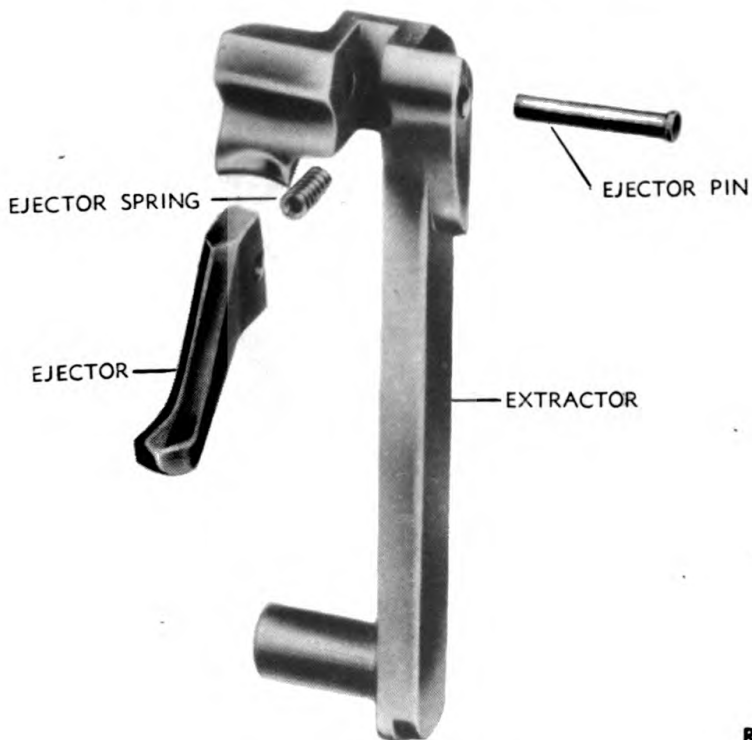
a. Rotate the cocking lever fully to the rear and release the firing pin by pressing the sear slide to the right. Then remove the extractor assembly by rotating it upward and pulling it out from the bolt (fig. 42). This frees the bolt switch.

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RA PD 65591

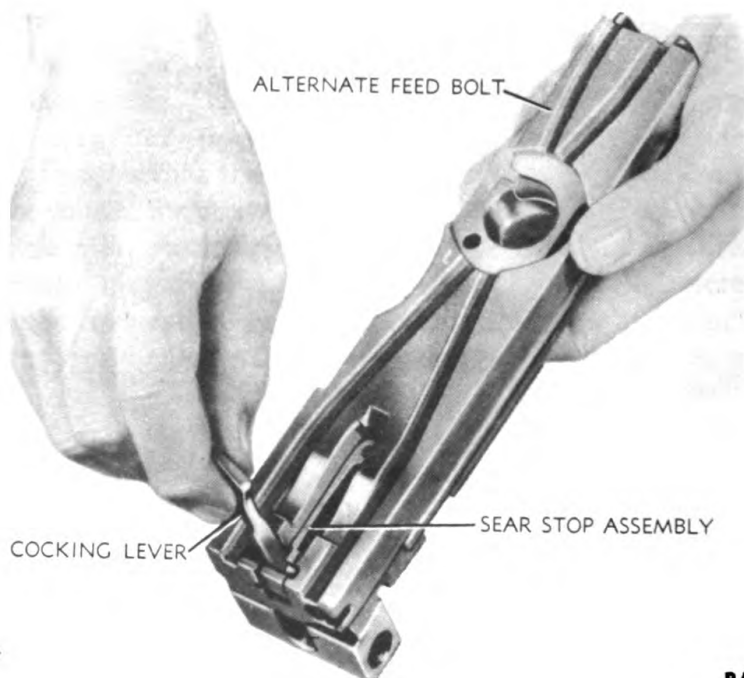
**Figure 42 — Removing Extractor Assembly**



RA PD 65592

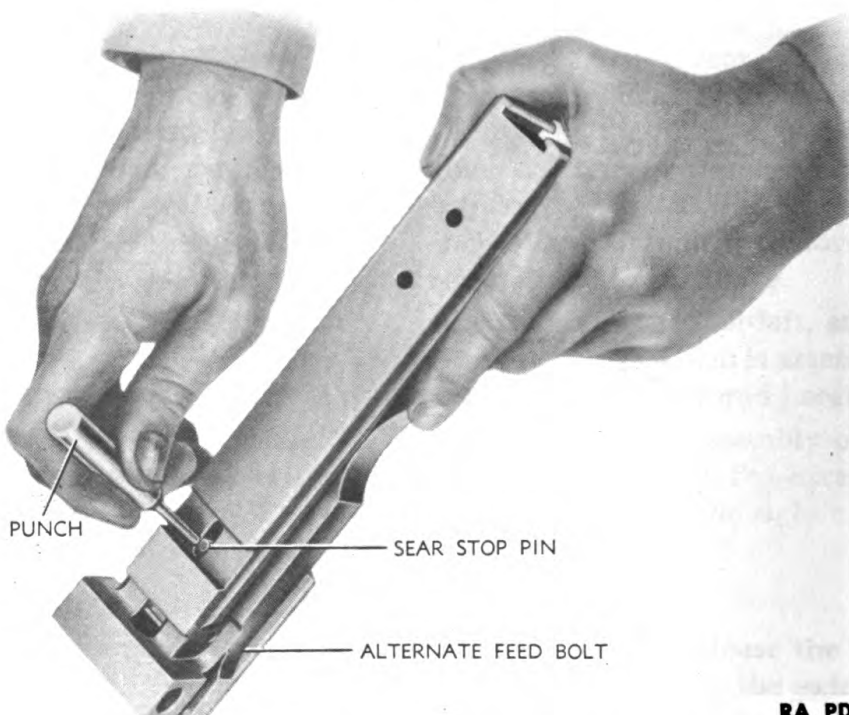
**Figure 43 — Extractor Assembly — Exploded View**

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RA PD 65593

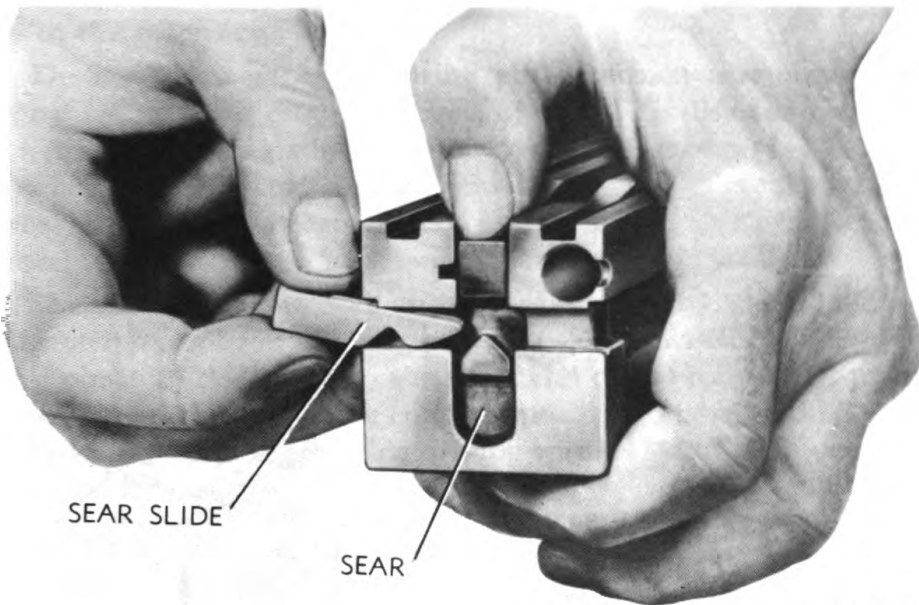
Figure 44 — Disengaging Sear Stop Assembly



RA PD 65594

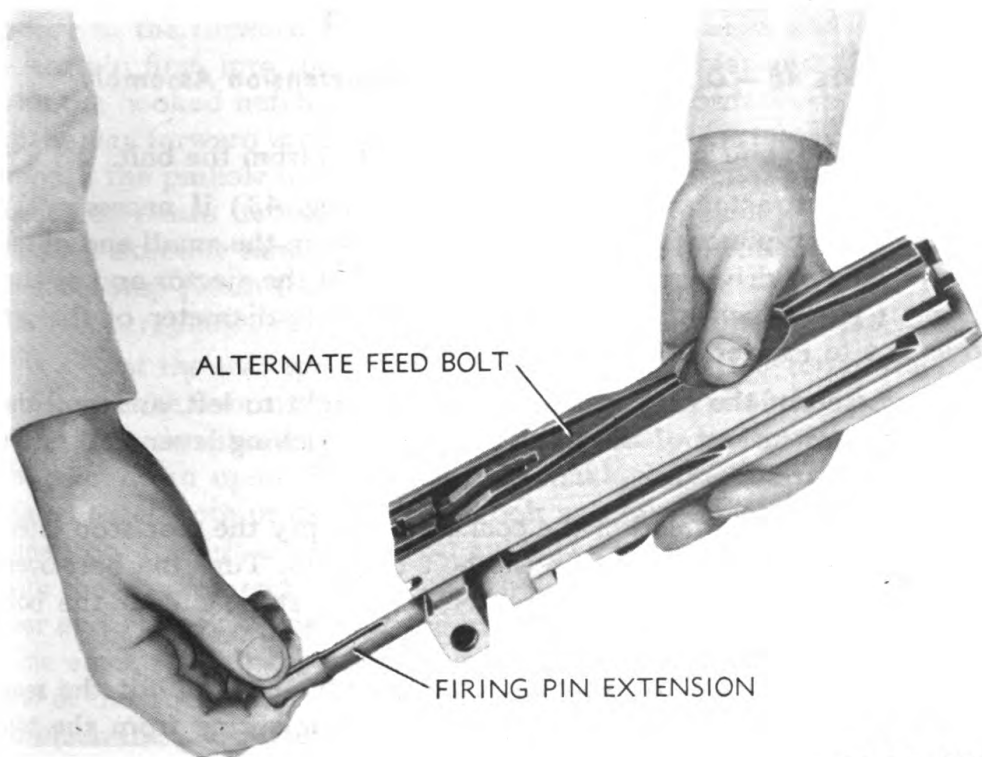
Figure 45 — Pushing Out Sear Stop Assembly

DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN



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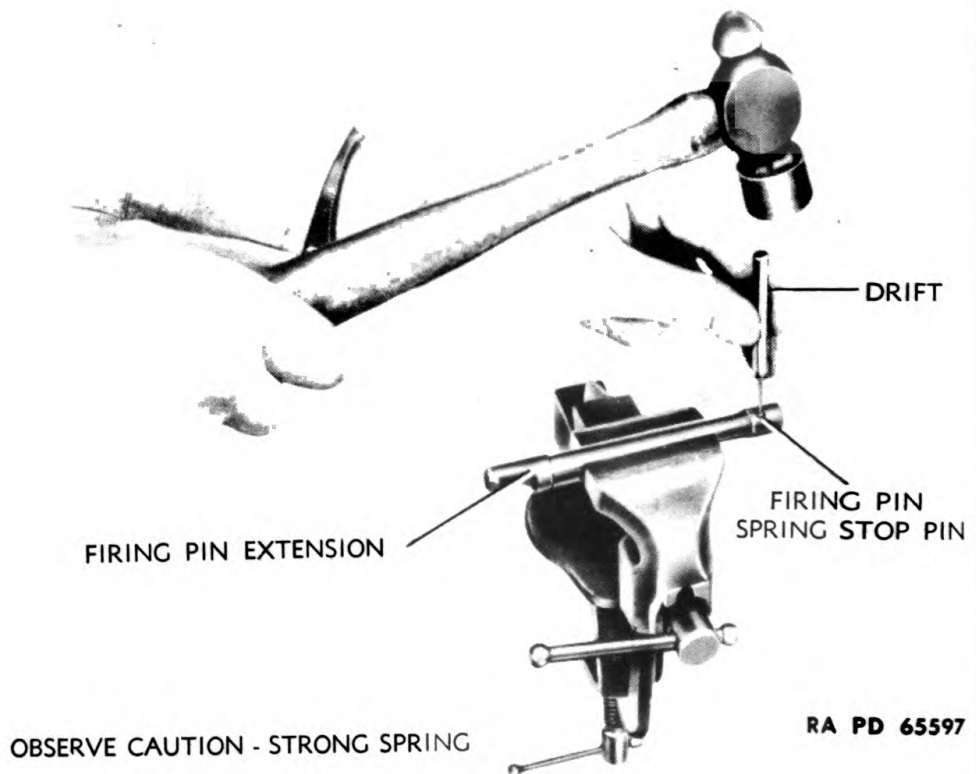
*Figure 46 — Removing Sear Slide*



RA PD 65596

*Figure 47 — Removing Firing Pin Extension Assembly, and Firing Pin*

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



**Figure 48 — Disassembling Firing Pin Extension Assembly**

- b. Lift the bolt switch and bolt switch stud from the bolt.
- c. The extractor may be disassembled (fig. 43) if necessary by placing a large punch in the conical depression in the small end of the ejector pin and driving out the pin. Then lift out the ejector and ejector spring. (The punch must bear upon the outside diameter of the pin so as not to expand it when driving out.)
- d. Push out the cocking lever pin from right to left, and pull the cocking lever up out of the bolt. Position of cocking lever and pin is shown in figure 42.
- e. Using the thin end of the cocking lever, pry the sear stop laterally out of its seating groove in the bolt (fig. 44). Turn the bolt over, and push the sear stop pin (assembled to the stop) out of the bolt (fig. 45).
- f. Press down on the sear with the thumb, and pull out the sear slide (fig. 46). Then remove the sear and sear spring from the top of the bolt.
- g. Elevate the front end of the bolt, and the firing pin extension and firing pin will slide out of the bolt (fig. 47). Then, disengage the

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

firing pin from the extension by sliding it laterally from the engagement groove in the extension.

h. Do not disassemble the firing pin extension assembly unless necessary for cleaning or replacement of parts. To disassemble, drive out the firing pin spring stop pin and remove the spring (fig. 48). Observe care to restrain spring when removing pin as it is under strong compression (fig. 49). It can be removed in a manner similar to that described for the driving springs in subparagraph i below.

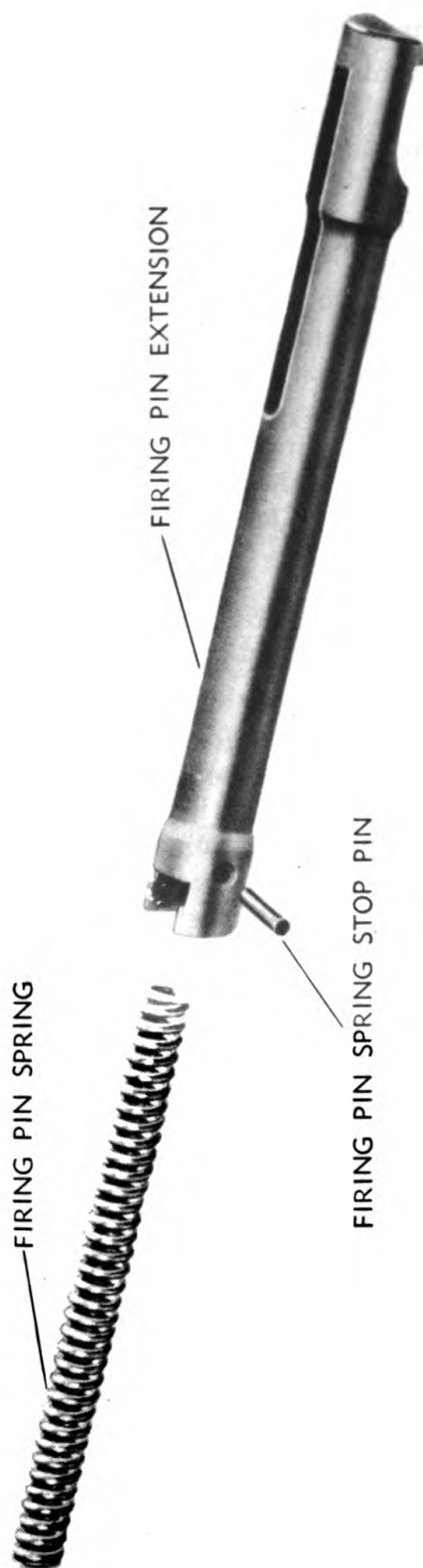
i. The driving spring rod and springs (fig. 50) should not be disassembled except for cleaning or repair. To disassemble, drive out the stop pin from the collar on the front end of the rod with a punch, allowing the punch to hold the collar in position. Then, holding collar against pressure of the expanding driving springs, withdraw punch and ease collar and springs from the rod. Observe care that collar does not spring off rod when punch is removed as it may cause injury to personnel.

### 50. BOLT GROUP ASSEMBLY (fig. 51).

a. If the firing pin extension has been disassembled, assemble by inserting the firing pin spring in spring well in the extension, compressing the spring into the well, and replacing the stop pin flush with the extension. Then, engage the rear end of the firing pin in the seating groove in the forward end of the firing pin extension, and insert the group, pin first, into the firing pin tunnel in the rear end of the bolt, with the hooked notch in the extension facing down. Push the group all the way forward in the bolt until the point of the firing pin protrudes through the pinhole in the face of the bolt. The firing pin group should drop freely into its well in the bolt when assembled. If there is any binding, examine tunnel for grease or foreign matter, and check to see that the stop pin in the extension is flush. If the fault is with the firing pin group, replace firing pin and/or extension with new ones.

b. Seat the sear spring firmly in its seat in the rear top of the bolt and insert the sear in the vertical grooves to the rear of the spring seat, with the wedge-shaped lug facing outward and pointing upward. Press the sear down upon the sear spring, making sure that the spring is seated level, both in its seat in the bolt and in the sear. Insert the sear slide from the *left* into its lateral guideway in the rear end of the bolt, with the pointed end leading and the notch down. Then, depress the sear and push the slide over the lug on the sear until the notch in the slide engages with the sear lug and holds it in position. (The *square end* of the sear slide must be pointing towards the side of the receiver to which the side plate trigger, solenoid, or other firing device is assembled.) The dimensions of the slide are critical, and if necessary to remove burrs, care should be exercised not to change dimensions or slope of faces.

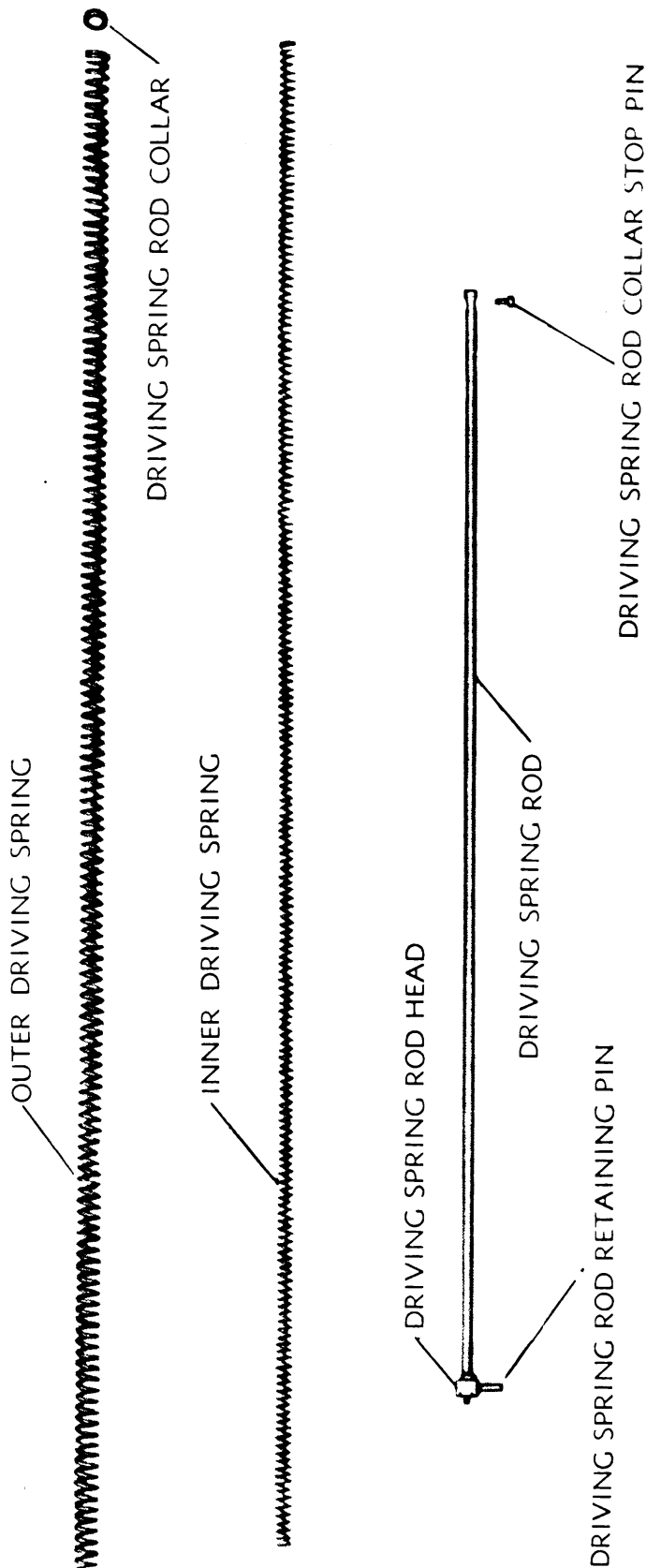
BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 65598

Figure 49 — Firing Pin Extension Assembly — Exploded View

DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

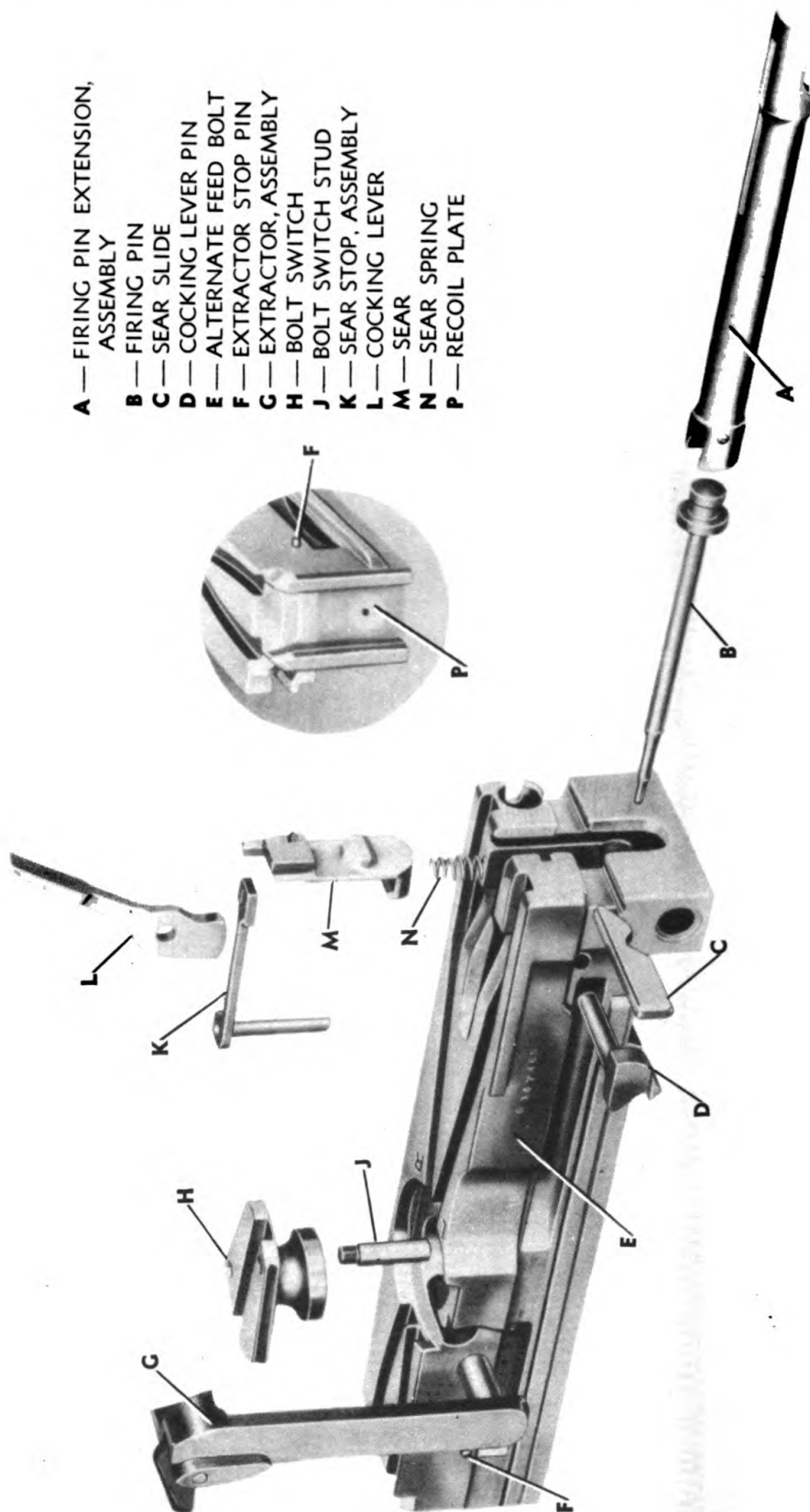


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Figure 50 – Driving Spring Rod Assembly with Springs



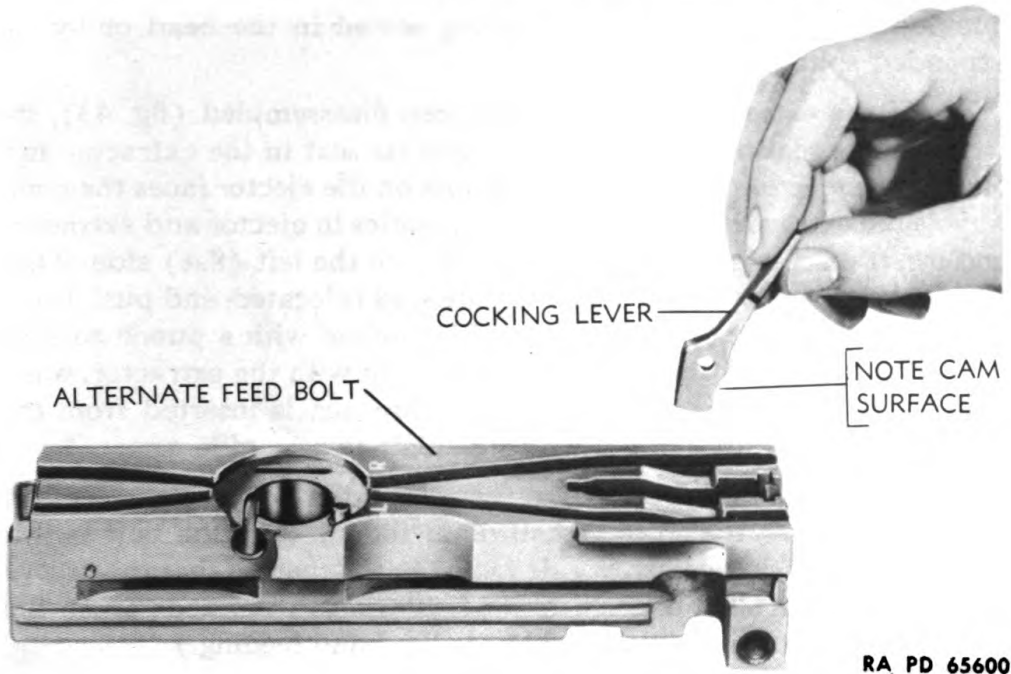
BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 65599

Figure 51 — Bolt Group — Exploded View

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RA PD 65600

**Figure 52 — Assembling Cocking Lever to Bolt**

c. Insert the pin of the sear stop assembly in the vertical hole in the rear top of the bolt and push pin down until the pin extends through the slot in the firing pin extension and lies between the rear end of the slot and the firing pin spring. When fully seated, swing the sear stop into its groove in the left side of the stop recess in the bolt to retain the sear, using the thin end of the cocking lever as a tool.

d. Insert the cocking lever, large end down and rounded cam surface to the rear (fig. 52), into the bolt and seat in the slot in the firing pin extension. Aline pinholes in bolt and cocking lever and insert cocking lever pin from the *left* side, lug on head pointing downward and push home flush with the bolt. Push the cocking lever all the way forward so as to engage the firing pin extension with the sear, and then press the sear slide to the right to depress the sear and release the firing pin extension. If properly assembled, the sear will release the firing pin extension to snap forward and a metallic sound should be heard. *Observe care that the cocking lever does not strike the fingers as it rotates rearward when the firing pin extension is released.* (The lever must be in the forward position when the bolt is assembled to the gun.)

**NOTE:** Recently designed cocking lever pin is of different shape than present pin and capable of being assembled from either side. It is important, however, that this pin be assembled to the bolt from the *left side*; otherwise the gun will not function properly. This pin is

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retained in the bolt either by a spring seated in the head or by an expanded split point.

e. If the extractor assembly has been disassembled (fig. 43), assemble it by seating the ejector spring in its seat in the extractor and placing the ejector over it so that the nose on the ejector faces the same way as the extractor pivot stud. Aline pinholes in ejector and extractor, and insert ejector pin, small end leading into the left (flat) side of the extractor, opposite the side on which the stud is located, and push home flush. The split end of the pin should be spread with a punch to hold the pin in place, and the head should be flush with the extractor, when assembled. (In guns of recent manufacture, pin is inserted from the right to preclude interference with side plate in case of looseness.)

f. Seat the bolt switch stud in its seat in the bolt switch recess in the top of the bolt with the small diameter up. Seat the bolt switch over the stud with the narrow side facing to the rear, so that the groove in the switch forms a continuation of the groove marked "L" in the bolt. (Bolt switch is positioned thus for left-hand feeding.)

g. Hold the assembled extractor vertically with ejector up, and insert pivot stud of extractor in hole in left side of bolt. Push fully in and rotate forward so that shoulder on extractor engages in the radial groove in the bolt to hold the assembly in position (fig. 42), and the extractor stud engages the groove in the shank of the bolt switch to hold it in position.

h. If the two driving springs have been removed from the rod, they may be replaced as follows:

(1) Slide the inner and outer spring onto the rod, compress on rod, and hold in position with small punch or nail thrust through hole in rod. The rod must be straight and no binding between inner spring and rod, or outer spring and inner spring.

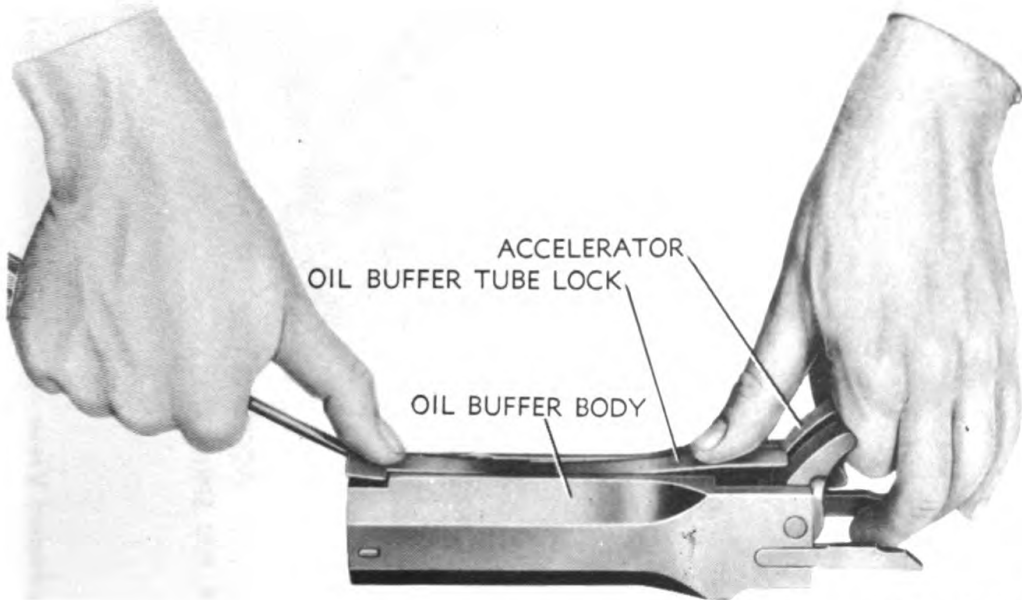
(2) Slide collar on rod and holding firmly withdraw punch, aline holes in collar and rod, and replace punch temporarily.

(3) Insert stop pin so that head will be on same side of rod as the retaining pin in the rod head, and drive through until flush, pushing punch out in process. Upset end of pin to hold in place. Observe care that collar does not slip and fly off during process as injury to personnel may result. (If old pin is damaged by removal, replace with new one.)

**51. OIL BUFFER GROUP DISASSEMBLY (figs. 54 and 59).**

a. Note the setting of the oil buffer tube as indicated by the arrow with respect to the "O" and "C" on the rear face of the oil buffer body, for convenience in assembling, and remove the tube group from the body by pressing on the end of the piston rod. (For setting of the oil buffer, refer to paragraph 37.)

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RA PD 65601

*Figure 53 — Removing Oil Buffer Tube Lock*

**NOTE:** Guns now issued have the oil buffer filled with light recoil oil, as this grade of oil has been found to be best at all temperatures. If there is any doubt as to the oil contained in the buffer, it should be drained out and refilled with the above oil (par. 36).

b. Place oil buffer body, bottom side up, on a flat surface. Elevate the tips of the accelerator with the fingers of left hand and press down on the end of the tube lock with the thumb. Then, using a screwdriver, pry up the rear end of the lock until disengaged from the buffer body and rotate the accelerator to the rear, thus forcing the lock out of the body. The pressure of the left thumb will keep the lock from springing out when released (fig. 53).

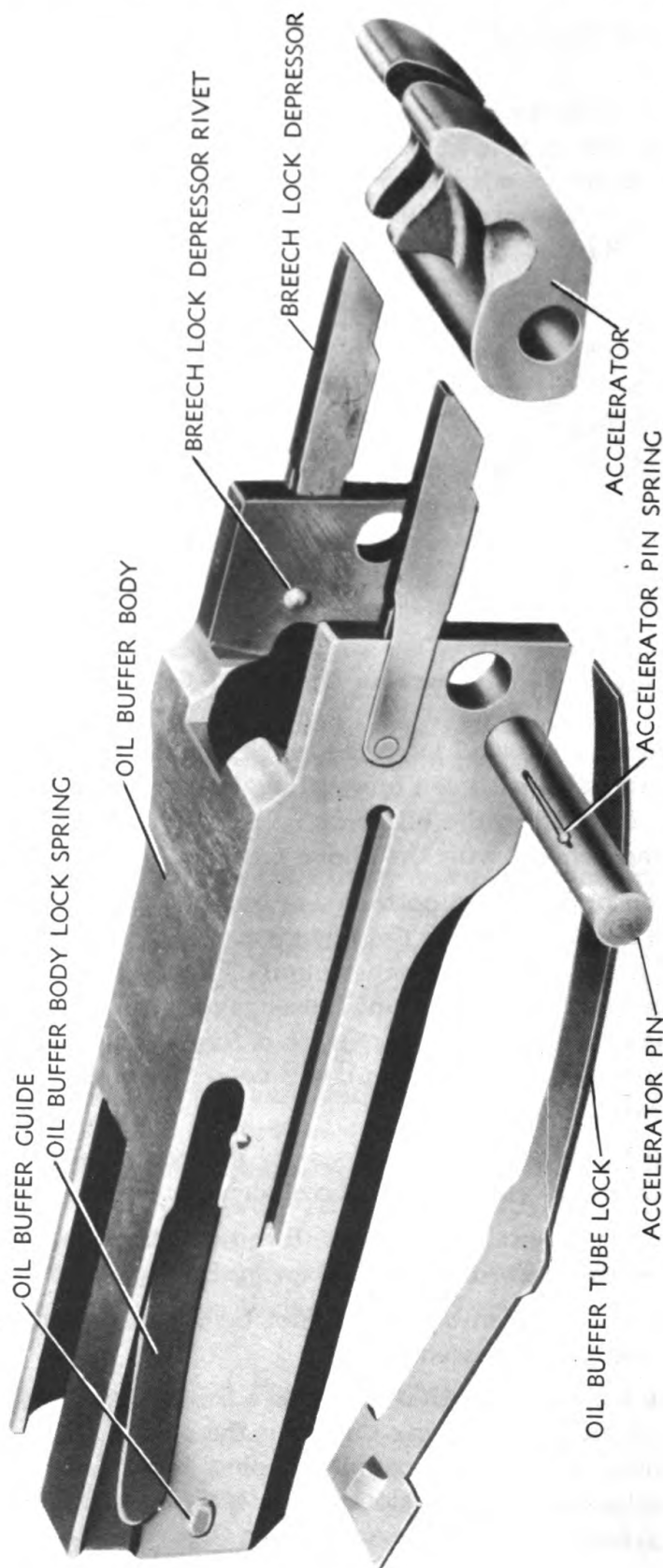
c. The oil buffer spring lock is staked in position and should not be removed unless necessary. To remove, drive out to the rear.

d. Push out the accelerator pin and remove the accelerator. The pin is spring-retained. Do not remove spring from pin.

e. The oil buffer assembly should not be disassembled except for cleaning or repairs. To disassemble:

(1) Place the base of the oil buffer on a firm surface and compress the oil buffer spring by pressing down on the spring guide (fig. 55), until the guide is free of the piston rod pins. Rotate the spring and guide one-quarter turn to aline slots in guide with pins, allow spring to expand slowly, and remove guide and spring (fig. 56). If a vise is avail-

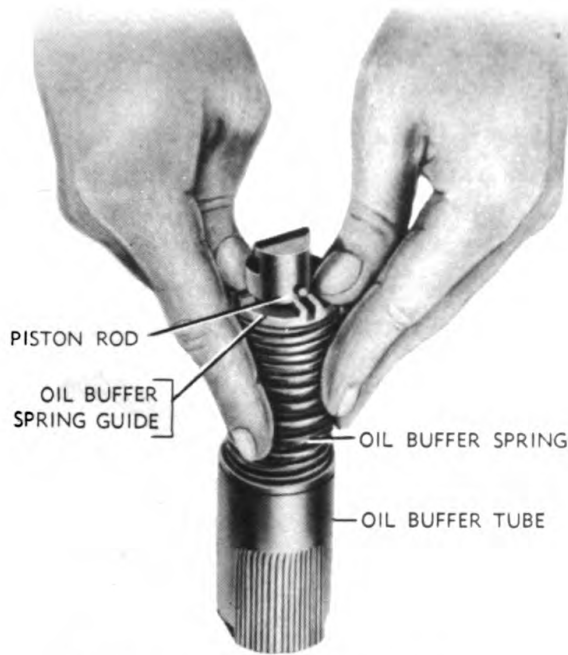
BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 65602

Figure 54 — Oil Buffer Body Group — Exploded View

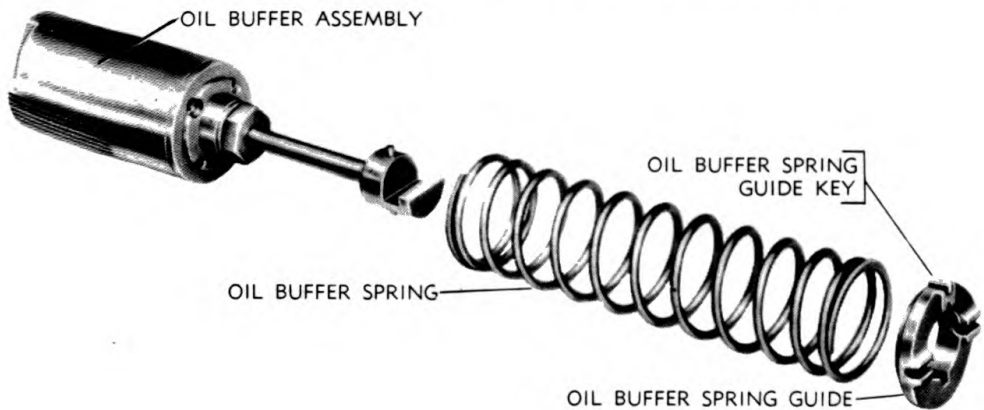
## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN



OBSERVE CAUTION - STRONG SPRING

RA PD 65603

**Figure 55 — Removing Oil Buffer Spring Guide and Spring**

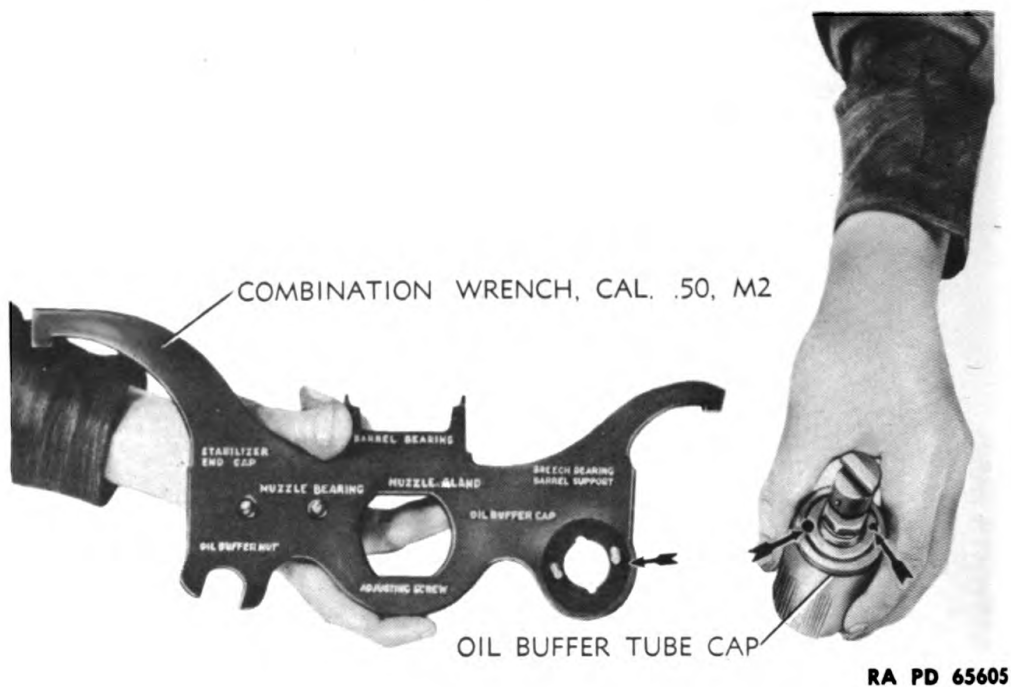


RA PD 65604

**Figure 56 — Oil Buffer Tube Group With Spring Guide and Spring Removed**

able, clamp spring guide firmly in vise, and press on base of tube to disengage the guide as already explained. This procedure is safer for personnel. Never clamp tube in a vise except by engaging the flats on the rear end. If the piston rod will not remain in the extended position due to oil resistance while the guide is being removed, it must be so held.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**



**Figure 57 — Method of Removing Oil Buffer Tube Cap**



**Figure 58 — Removing Oil Buffer Packing Gland Plug**



## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

**CAUTION:** Observe care during disassembly, as the oil buffer spring is under high tension.

(2) Using a proper screwdriver, remove the filler screws from the base of the tube and drain out the oil.

(3) Clamp the oil buffer tube in a vise by engaging the flats on the base and unscrew the oil buffer cap, counterclockwise, using the projections on the Combination Wrench M2, marked "oil buffer cap" (fig. 57). Then, withdraw the piston and other parts from the tube.

**NOTE:** The threads of the cap sometimes "freeze," and if pressure is applied quickly, the pins on the wrench may break off. Care should be observed to apply pressure evenly.

(4) Remove the piston head nut pin and unscrew the piston head nut from the rod, then remove the piston valve assembly and unscrew the piston rod head from the rod. Note the number of turns necessary to unscrew the head from the rod for convenience in assembling. The piston rod head should not be removed by using arms except in emergency or to replace packing. Its position, however, should be checked as prescribed in assembly (par. 52). This is most important.

(5) Unscrew the packing gland plug from the cap by inserting the cap in the hole in the Combination Wrench M2, marked "oil buffer cap," and using open-end wrench (fig. 58). Then remove the cap, together with the packing gland spring, ring, packing, and plug from the piston rod.

(6) The relief valve can be removed from the tube cap by removing the screw, and then lifting out the spring and valve.

### 52. OIL BUFFER GROUP ASSEMBLY (figs. 54 and 59).

a. If the oil buffer assembly has been disassembled, assemble as follows:

(1) Place the packing gland plug, gland packing, gland ring, gland spring, and tube cap, on the piston rod in the order named, being sure the bevel of the packing fits into the bevel in the gland ring. Screw gland plug into tube cap and tighten sufficiently to prevent oil leakage, using Combination Wrench M2, and end wrench as explained in paragraph 51 e (5). (Test for leakage after tube has been filled with oil.)

**NOTE:** Packing of recent manufacture A153162 is cylindrical in shape with square ends and assembled in the same order with a (flat) washer A153161 and spring A153163 in place of the gland ring and spring above. This new type packing is superior to the old conical packing and should be used when available when replacing packing or when leakage occurs with old type conical packing. This new type packing must be assembled with the new type flat washer and new type spring. The new type spring has about double the tension of the old type spring. Any leakage with this new type packing should be



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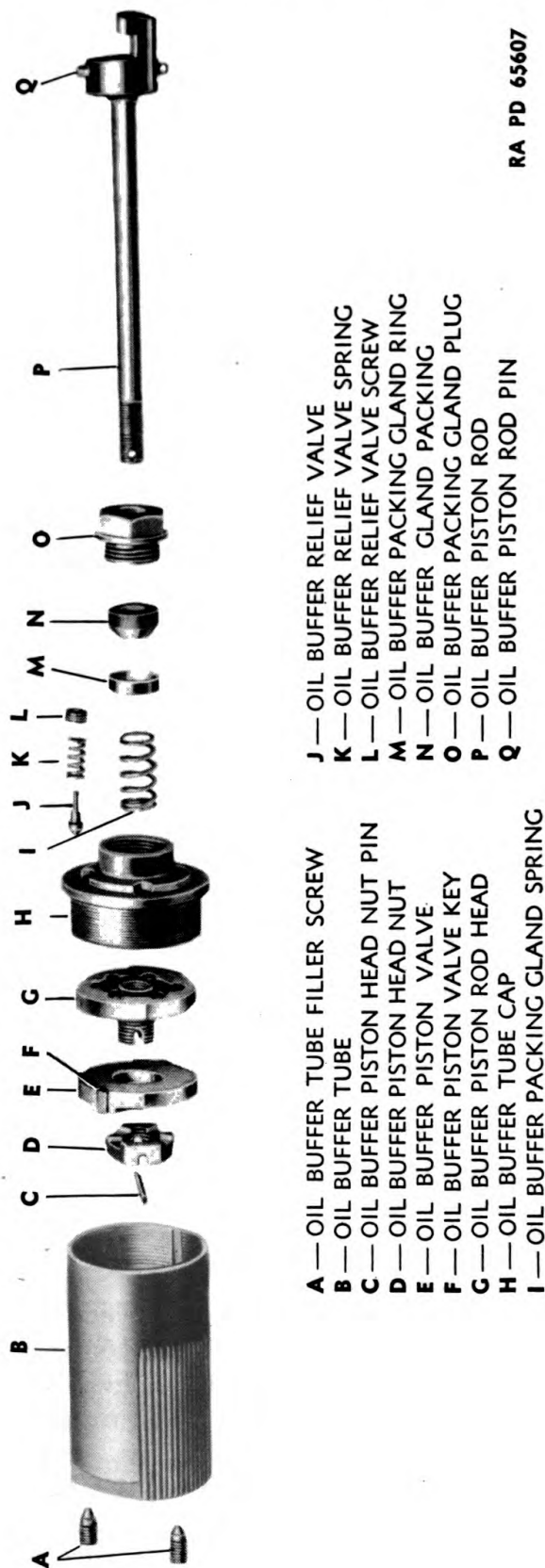
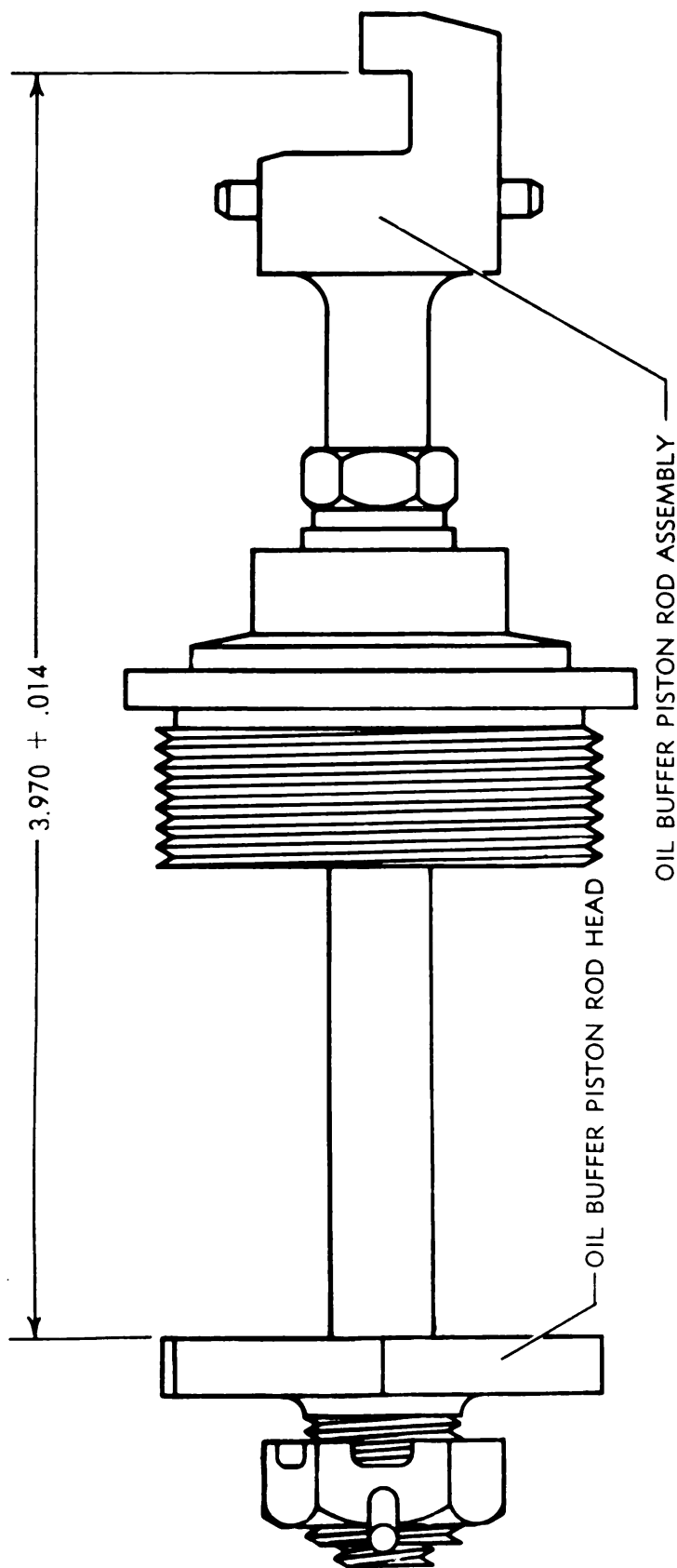


Figure 59 — Oil Buffer Assembly — Exploded View

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RA PD 68444

Figure 60 — Adjustment of Oil Buffer Piston

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reported to the Office, Chief of Ordnance, SPOFM — Field Service, Maintenance Branch, Small Arms Section.

(2) Screw piston rod head on rod, with shoulder away from the cap, the same number of turns as when removed. If this has not been noted, screw it on until the distance from the forward face of the piston rod head to the forward face of the notch in the front end of the rod is not less than 3.970 plus 0.014 inches, when assembled (fig. 60).

(3) Place valve assembly on the shoulder of the rod head with the flat face toward the rod head. Screw the piston head nut onto the rod head with the flat side towards the valve, allowing a clearance of approximately 0.050 inch between the rod head and valve assembly. (A tube lock or a new dime may be used as a thickness gage.) Aline the slots in the nut with the slot in the shoulder of the rod head and with the hole in the rod (already alined) and insert the piston head nut pin with the bulge in the head engaging one notch in the nut, and then bend the straight end down into the opposite notch. If the "alternate" (straight) pin is furnished, bend both ends down into opposite notches in the nut, or bend to sides around nut, so as not to interfere with valve action.

(4) Insert the rod and its assembled parts into the oil buffer tube with the valve key lugs riding in the grooves in the inner wall of the tube. Screw on and tighten the tube cap securely, using the Combination Wrench M2.

(5) If the relief valve has been removed from the cap, replace valve in cap, followed by spring, and screw in the screw snugly.

(6) In order for the oil buffer spring to function properly in the gun during the complete recoil and counterrecoil strokes, the assembled length of the oil buffer assembly must be within the proper dimensions. The distance from the rear face of the oil buffer tube to the extreme forward face of the oil buffer piston rod when extended, must be within 6.525 and 6.553 inches. This dimension is most important to the proper functioning of the gun, and if not within prescribed limits it should be referred to responsible ordnance unit for correction or advice (par. 25 a (6) ).

(7) Fill the oil buffer with oil as prescribed in paragraph 36. By filling the oil buffer before assembling the oil buffer spring, the rod is held in a convenient position for assembly.

(8) To assemble the oil buffer spring to the oil buffer assembly, place the base of the oil buffer tube on a firm flat surface with piston rod fully extended. Seat the spring on the cap and the spring guide on the spring with flat surface bearing on the spring, and the notches in

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the inner diameter of the guide in line with the cross pin in the rod. When so placed, the notch in the piston rod should be on the opposite side of the tube from the teeth, and the key on the guide likewise. This position will bring the notch up, teeth down, and key on right, when assembled. Observing care to avoid injury, press guide down against spring, thus compressing it, until the pins pass through the slots in the guide, and the top of the guide is below the pins (fig. 55). Then, turn the guide one-quarter turn counterclockwise to align seating notches in top of guide with cross pin in the rod and allow the guide to rise, thus seating pin in notches in the guide. If a vise is available, it is easier and safer to clamp the guide firmly in the vise and press upon the oil buffer tube as described in paragraph 51 e (1).

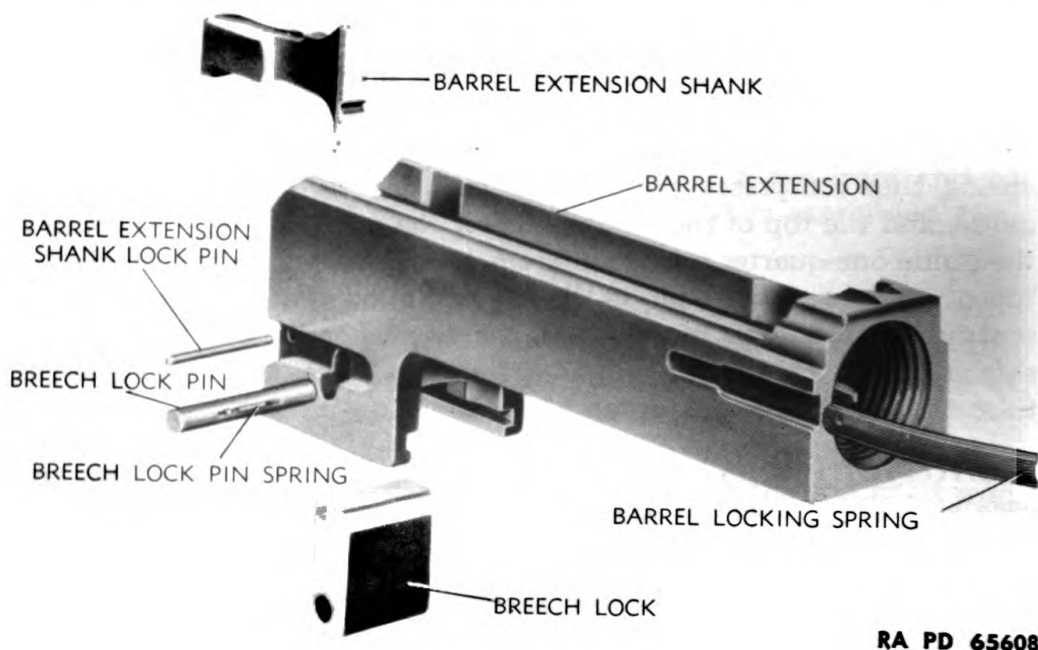
**CAUTION:** When compressed, the spring is under high tension and care should be observed to guard against slipping of the parts during assembly to avoid injury to personnel.

b. Position the accelerator in the forward end of the oil buffer body with the tips up, align pinholes, and insert accelerator pin. Push pin through until flush with both sides of the oil buffer body. The accelerator pin is retained in position by a spring assembled to the pin. Check pin to see that spring is properly assembled before inserting pin in oil buffer body.

c. Place oil buffer body upside down on a firm surface and lay the tube lock on the body with the bowed side away from the body. Depress the lock so as to force the projecting ears into the circular recesses in the groove in the oil buffer body. Holding the lock down in this position, grasp the projecting end of the lock and slide it toward the accelerator, lifting the projecting end slightly so that the lug on the lock clears the body and the ears slide into the undercut in the groove as shown in figure 53. When assembled, the lug on the lock should seat in the hole in the bottom of the body, and the opposite end of lock bear upon accelerator when in rearward position (par. 86 e (2)). The lock should *not* bind in the slot in the body. Any binding should be relieved.

d. If the oil buffer body spring lock has been removed from the oil buffer body, slide it into its groove so that free end points out, and stake in position. Then, slide the oil buffer assembly into the oil buffer body from the rear so that the guide key in the edge of the spring guide engages with the slot in the right side of the body. Turn the piston rod so that the notch faces upward. The guide key should move freely in the slot in the body. Set the oil buffer so that the arrow on the rear end of the tube points between the "O" and "C" on the rear face of the body as noted when disassembling. If former setting was not noted, set arrow to point at a spot one-third the distance between the "C" and the "O" (six clicks from "C") on body as initial setting (par. 37).

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**Figure 61 — Barrel Extension Group — Exploded View**

**53. BARREL AND BARREL EXTENSION GROUP DISASSEMBLY (figs. 61 and 62).**

a. With the barrel unscrewed from the barrel extension, remove the barrel locking spring by sliding it forward out of its seat in the right side of the barrel extension.

b. Using a punch, push out the breech lock pin and remove the breech lock from the bottom of the barrel extension. The pin is spring-retained.

c. The barrel extension shank should not be removed by using arms.

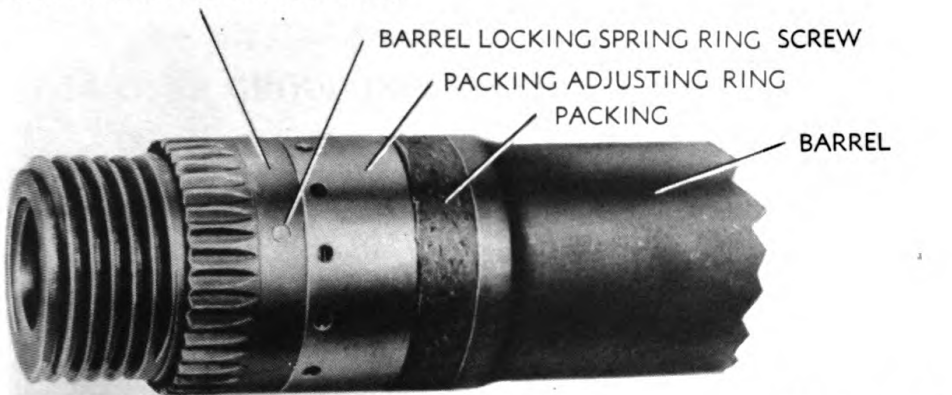
d. The barrel sleeve is assembled to the barrel at manufacture and should not be removed (fig. 62) The barrel locking ring is assembled to the barrel and locked in place by two screws. The screws are set and the heads filed flush with the ring at manufacture. This ring should not be removed. The packing adjusting ring is threaded onto the barrel just ahead of the barrel locking spring ring and just to the rear of the packing groove in the rear of the barrel. The ring can be screwed back and forth sufficiently to insert and adjust the packing, but is not removable.

**54. BARREL AND BARREL EXTENSION GROUP ASSEMBLY (figs. 61 and 62).**

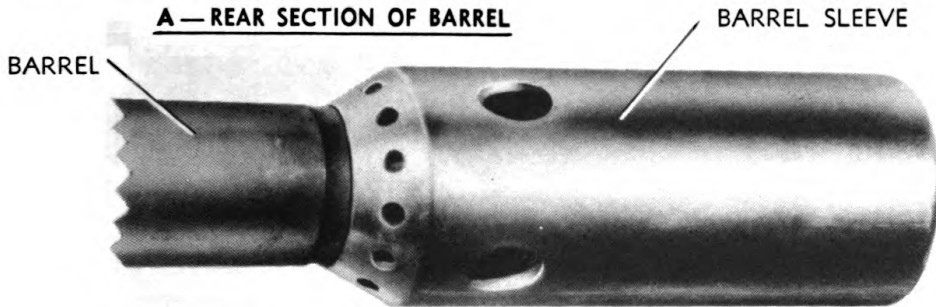
a. Insert the breech lock into its vertical aperture from the bottom so that the bevels on the lock are forward and the double bevel

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

BARREL LOCKING SPRING RING



A — REAR SECTION OF BARREL



B — FRONT SECTION OF BARREL

RA PD 51077

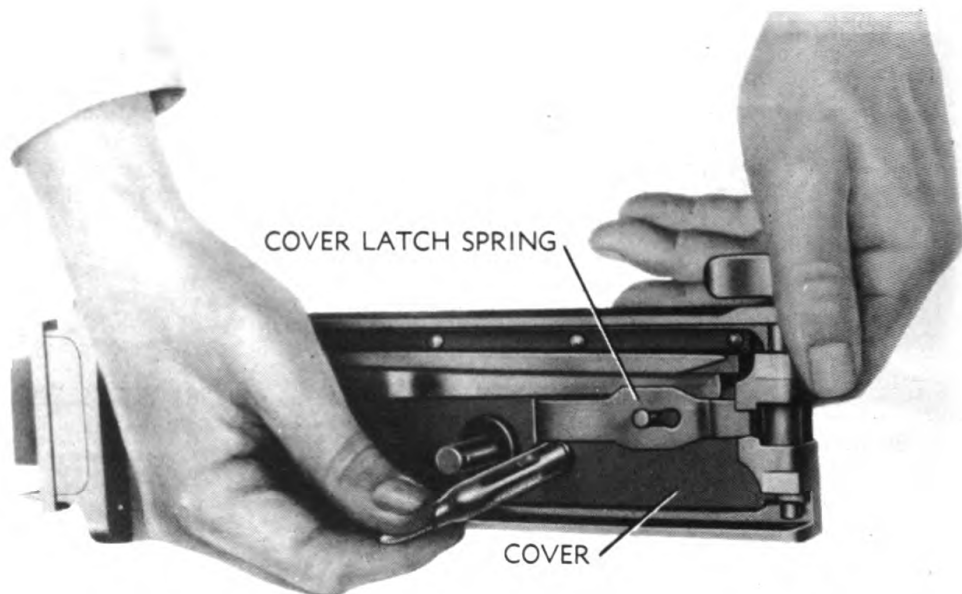
**Figure 62 — Rear and Front Sections of Barrel Assembly**

up. Aline pinhole in lock and slot in extension, and push pin through until flush with both sides of the barrel extension. The lock pin is spring-retained. Check pin to see that spring is properly positioned in the pin before assembling.

b. If the barrel locking spring has been removed, slide it into the groove in the right face of the extension so that it is retained by the undercut, and the wedge-shaped lug points inward.

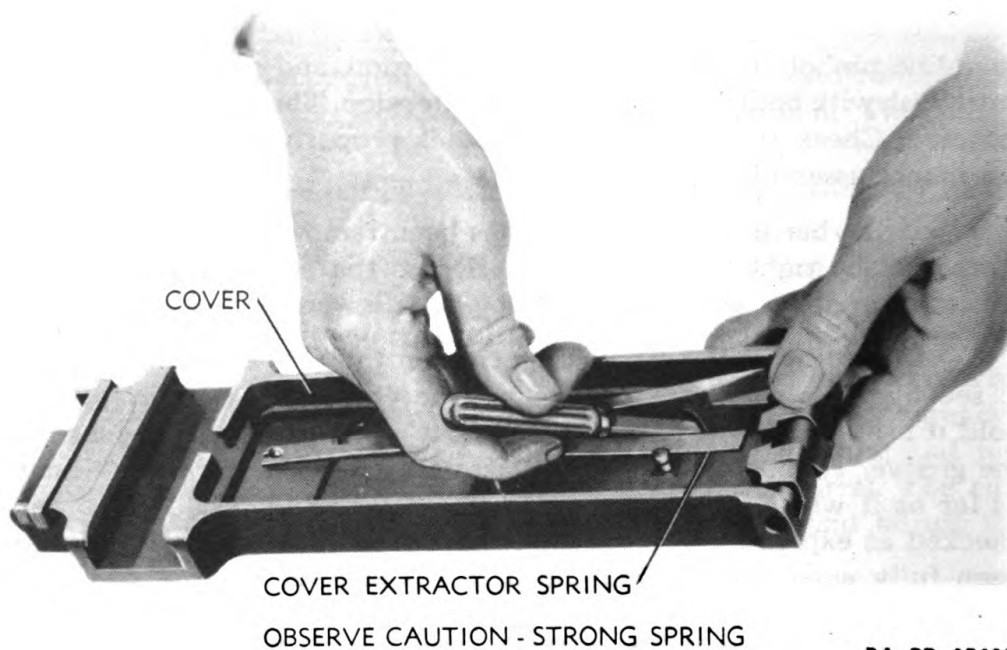
c. Check the packing adjusting ring on the rear end of the barrel to see that it is snugly seated against the packing just sufficiently to hold it firmly in place, and the packing is smoothed down in place in the groove. Then, screw the barrel assembly into the barrel extension as far as it will go. Headspace and packing should be adjusted and checked as explained in paragraphs 45, 46, and 65 after the gun has been fully assembled. When the barrel is screwed all the way into the extension, the rear end should protrude slightly through the extension. If this is not the case, the dimensions of the barrel or barrel extension are incorrect and a true headspace adjustment cannot be made. In such a case, the barrel should be replaced. With the barrel

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RA PD 65609

Figure 63 — Removing Cover Latch Spring



RA PD 65610

Figure 64 — Removing Cover Extractor Spring

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

screwed in as above, the recoiling parts will probably not go fully into battery when the gun is assembled, until the headspace is adjusted.

### 55. COVER GROUP DISASSEMBLY (fig. 65).

a. The cover need not be removed from the gun for disassembly but it is best to remove it (par. 43 e). To disassemble, withdraw the belt feed lever cotter pin, move the lever so that the forward end is in line with the slot in the cover, and then lift it up off its pivot stud, observing care that the plunger and spring seated in the lever do not fly out. Remove the lever plunger and spring from their seat in the side of the lever.

b. Slide the belt feed slide laterally out of cover; then push out the belt feed pawl pin from the slide, using a small punch, and remove the belt feed pawl, pawl spring, and pawl arm. Hold pawl down on spring when removing pin to prevent it from flying out.

c. Lift end of cover latch spring out of the transverse groove in the cover and shift it laterally to bear on the cover extractor spring (fig. 63). Then, press down on the cover latch spring, slide it away from the cover latch, and remove it from its stud. Observe care that the cover extractor spring does not fly out and cause injury when the latch spring is removed.

d. Pry the end of the cover extractor spring laterally out of the recess in the cover extractor cam (fig. 64), and disengage from the holding stud on the opposite end. Press down while removing to prevent flying out.

e. The cover latch may be removed by pulling out the cotter pin from the cover latch shaft, turning the shaft to the latched position, and then withdrawing from the cover. The latch can then be lifted out.

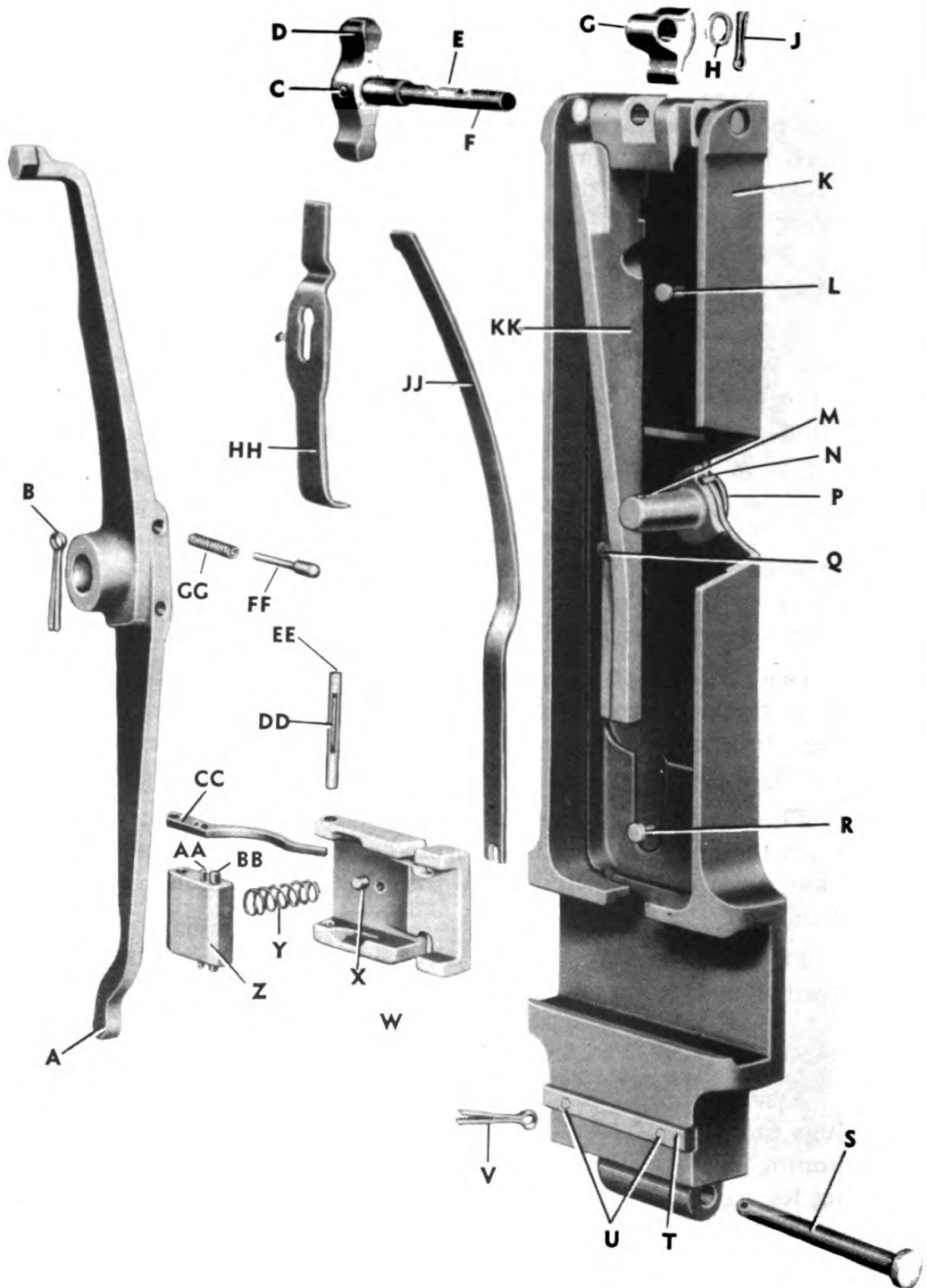
f. The cover extractor cam is riveted in place and should not be removed. Check to see that rivets are tight.

### 56. COVER GROUP ASSEMBLY (fig. 65).

a. Assemble the latch to the cover by placing the latch between the lugs on the under side of the rear end of the cover, so that the positioning keyway is toward the latch end of the cover and the projecting lug against the under side. Aline shaft hole in latch and cover, insert shaft from *left* side with the key towards the latch end of the cover, and push through so that key mates in keyway in the latch. Place washer on end of shaft, and secure by inserting cotter pin and spreading prongs. Cotter pin should be inserted with the head towards the hinged end of the cover and the prongs bent snugly around the shaft for clearance with the retracting slide when oper-



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**Figure 65 – Cover Group – Exploded View**

# DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

- A — BELT FEED LEVER
- B — COTTER PIN
- C — COVER LATCH SHAFT LEVER PIN
- D — COVER LATCH SHAFT LEVER
- E — COVER LATCH SHAFT KEY
- F — COVER LATCH SHAFT
- G — COVER LATCH
- H — COVER LATCH SHAFT WASHER
- J — COTTER PIN
- K — COVER
- L — COVER LATCH SPRING STUD
- M — BELT FEED LEVER PIVOT STUD
- N — BELT FEED LEVER PIVOT STUD PIN
- P — BELT FEED LEVER PIVOT STUD WASHER
- Q — COVER EXTRACTOR CAM RIVET
- R — COVER EXTRACTOR SPRING STUD
- S — COVER PIN
- T — BRACKET
- U — COVER BRACKET RIVET
- V — COTTER PIN
- W — BELT FEED SLIDE
- X — BELT FEED PAWL SPRING STUD
- Y — BELT FEED PAWL SPRING
- Z — BELT FEED PAWL
- AA — BELT FEED PAWL ARM LOCATING PIN
- BB — BELT FEED PAWL ARM PIN
- CC — BELT FEED PAWL ARM
- DD — BELT FEED PAWL PIN SPRING
- EE — BELT FEED PAWL PIN
- FF — BELT FEED LEVER PLUNGER
- GG — BELT FEED LEVER PLUNGER SPRING
- HH — COVER LATCH SPRING
- JJ — COVER EXTRACTOR SPRING
- KK — COVER EXTRACTOR CAM

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## *Nomenclature for Figure 65 — Cover Group — Exploded View*

ated. (The shaft must be inserted from the side opposite to which the retracting slide is assembled, in order that there shall be proper clearance when the cover is closed. In this gun, the retracting slide is positioned on the right side of the gun when used with the mounts covered in this manual.)

b. Install the cover extractor spring by hooking the slotted end under the extractor spring stud in the hinge end of the cover, with the bulge facing away from the cover. Hold the slotted end firmly against the stud, depress the spring and swing the opposite end laterally so that the projection is retained in the slot in the cover extractor cam.

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c. Position the cover latch spring in the cover over the latch spring stud with the hooked end down and away from the latch, and the opposite end bearing upon the projecting lug on the latch. Depress the spring and slide it towards the latch so that it is engaged under the head of the stud and the hooked end engages in the transverse groove in the cover.

d. Position the belt feed pawl arm on the belt feed pawl arm pin, and locating pin on the pawl, so that it will be towards the latch end of the cover when the slide is assembled to the cover (fig. 66). Then, place the small end of the belt feed pawl spring on its stud on the slide and place the assembled pawl and arm over the spring so that the large end of the spring seats in the recess in the pawl and the pinholes in pawl, arm, and slide aline. Depress pawl against spring and push belt feed pawl pin through until flush with both sides of the slide. Be sure retaining spring is properly positioned in the pin before assembling.

e. Place the assembled belt feed slide in the slideway in the cover with the lever slot to the right and away from the cover, the pawl towards the left side and pointing right, and the arm on the side of the pawl towards the cover latch and pointing right. Insert the belt feed lever plunger spring and then the plunger into the plunger seat, in the side of the lever, nearest the diamond-shaped bolt guide lug on the lever. Then, aline the slot in the belt feed slide with the slot in the cover and position the lever, shoulder up, on the lever pivot stud in the cover so that the diamond-shaped bolt guide lug on the lever will be towards the latch end of the cover, the plunger in the lever bears upon the side of the cover, and the lever lies in the alined notch in cover and slide. Press the lever fully down on the pivot stud so that the end towards the slide seats in the slide and the lever cam moves laterally in the transverse slot in the cover. Insert the cotter pin in the pivot stud and spread the prongs to hold the lever in position on the stud.

f. The assembly described above is for *left-hand* feeding of the gun, as the gun must be fed from this side when used with the mounts covered in this manual. To assemble the cover for right-hand feeding, the belt feed slide and pawl must be reversed and the arm assembled on the opposite side of the pawl. The belt feed lever plunger must be positioned in the hole in the lever nearest the slide end of the lever. The function of the spring plunger is to position the bolt guide lug on the lever over the proper guideway cut in the top of the alternate feed bolt when the cover is raised so that it will mate properly when the cover is closed and latched. The bolt switch, cartridge stops, belt holding pawl, and other parts must also be assembled properly for left-hand feed as explained in paragraphs 50 and 58. Correct positioning of parts for left- and right-hand feeding is shown

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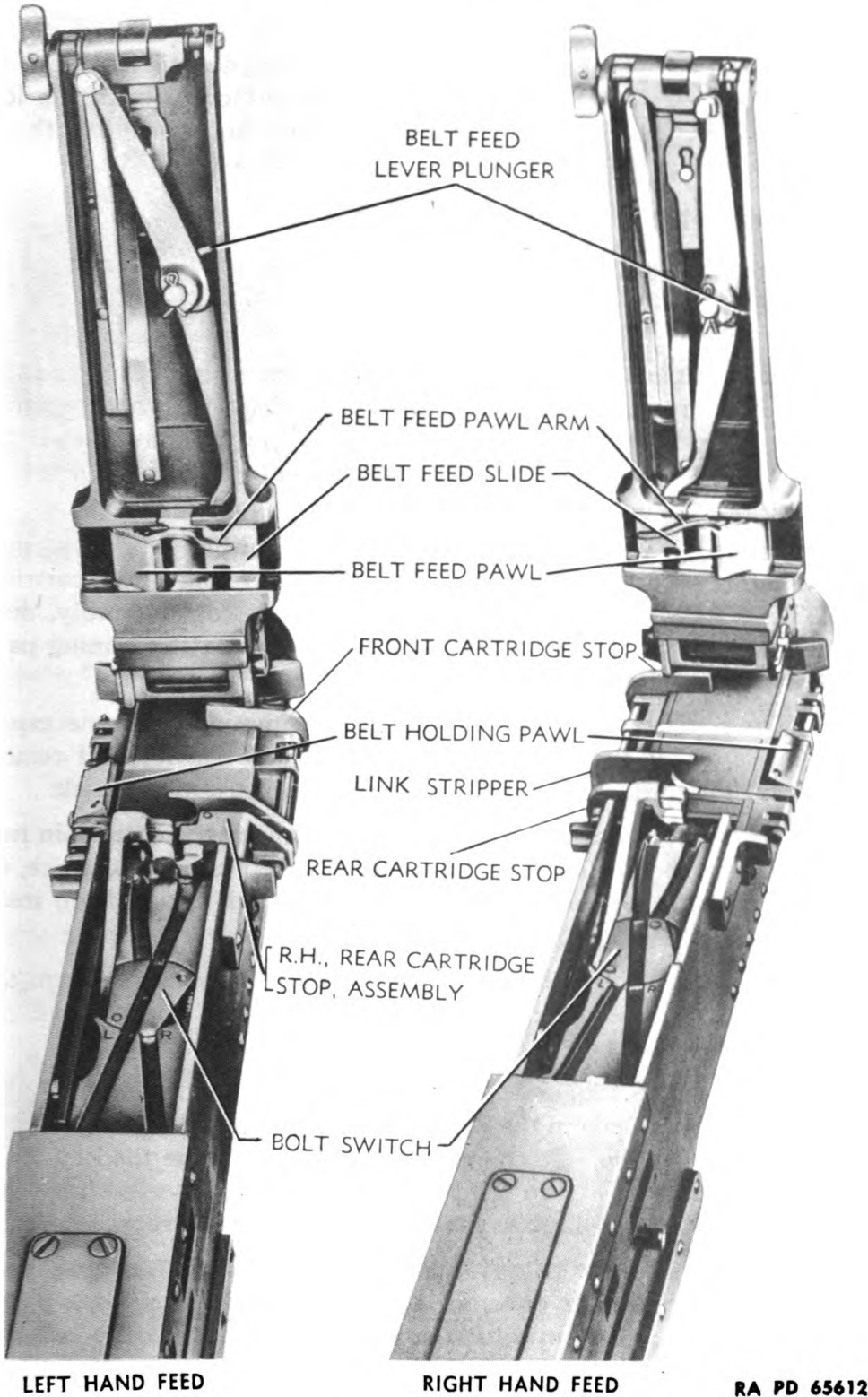


Figure 66 — Bolt, Cover, and Receiver Groups Showing Parts Assembled for Left- and Right-hand Feeding

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in figure 66, and positioning of parts for right-hand feed explained in paragraph 68.

**NOTE:** The belt feed slide has been redesigned to facilitate the lifting of long ammunition belts. When such difficulty in lifting long belts is experienced, the belt feed slide should be replaced with one of the new design as described in paragraph 25 a (11).

**57. RECEIVER GROUP DISASSEMBLY.**

a. Remove the belt holding pawl and spring (or springs) by withdrawing belt holding pawl pin to rear (fig. 67). Hold pawl down during removal to prevent loss of spring.

**NOTE:** In guns of recent manufacture, the belt holding pawl is assembled with two springs. Care should be observed when replacing springs, to assemble the correct spring or springs, and pawl. For identification of parts, refer to **NOTE** in paragraph 58 h (3).

b. Withdraw right-hand belt holding pawl pin in similar manner to subparagraph a above, and remove the right-hand rear cartridge stop assembly (or rear stop and link stripper) and front cartridge stop. To disassemble right-hand rear cartridge stop assembly, drive out the alining pawl pin with a punch and remove the alining pawl, plunger, and spring, from the stop (fig. 68).

c. The cover detent pawl should not be removed unless necessary. To remove, press the pawl forward against the spring and remove cotter pin. Then withdraw pawl and spring from trunnion block.

d. The switch can be removed by withdrawing the cotter pin from the switch pivot stud extending through the left-hand side plate, unscrewing the nut, and removing switch and switch spring from inside of receiver (fig. 69).

e. To remove the breech lock cam, withdraw cotter pin from cam bolt projecting through bottom plate, unscrew nut, and remove cam from inside receiver.

f. Remove the trigger bar pin by barely lifting the lock (fig. 70) out of its retention hole in the left-hand side plate and rotating it downward until slightly beyond the vertical position to aline the key lug on the pin with the keyway in the side plate. When properly alined, pull the pin out and remove the trigger bar from inside the receiver.

g. The side plate trigger assembly used with this gun when mounted on the mounts covered in this manual is listed as a part of the mount, and carried in a tubular container affixed to the left-hand cradle plate of the mount when not attached to the gun. For convenience, the removal and reinstallation of the trigger are covered at this point while its disassembly and assembly are explained in paragraphs 63 and 64, and figure 78. The side plate trigger assembly is removed

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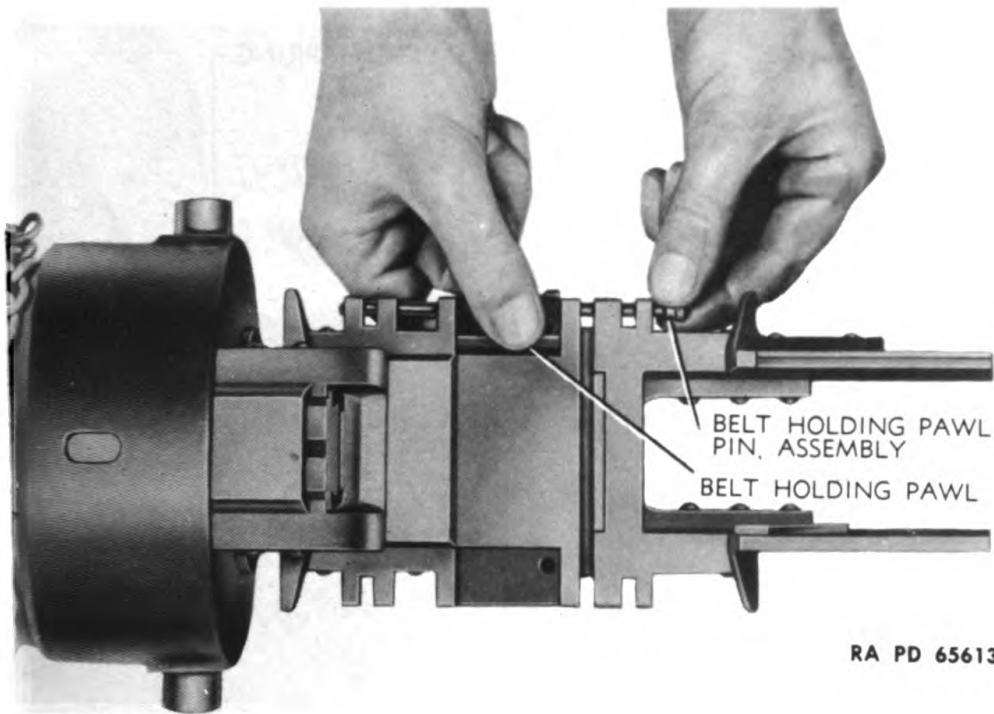


Figure 67 — Removing Belt Holding Pawl — (Pawl Shown Here Is Assembled for Right-hand Feeding)

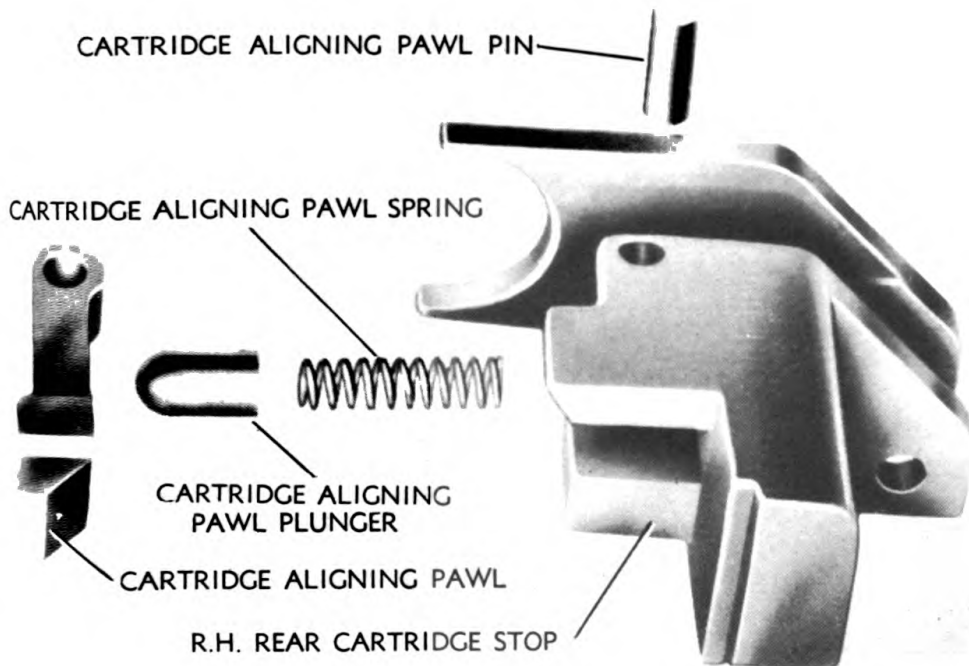


Figure 68 — Right-hand Rear Cartridge Stop Assembly — Exploded View

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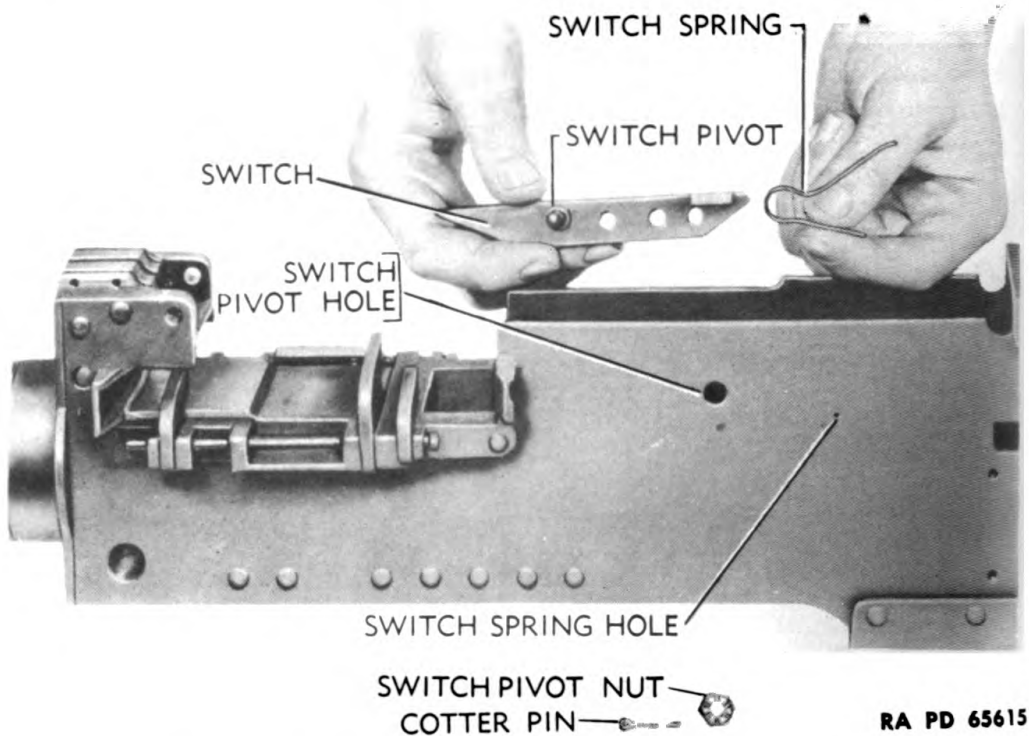


Figure 69 — Removing Switch and Switch Spring

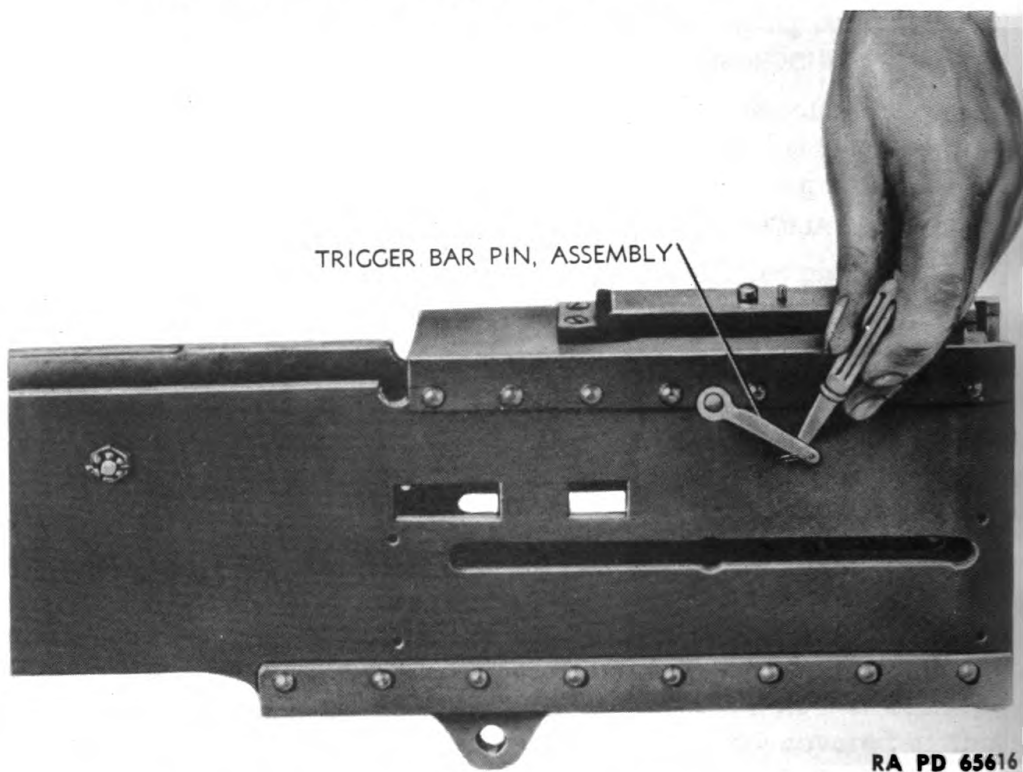
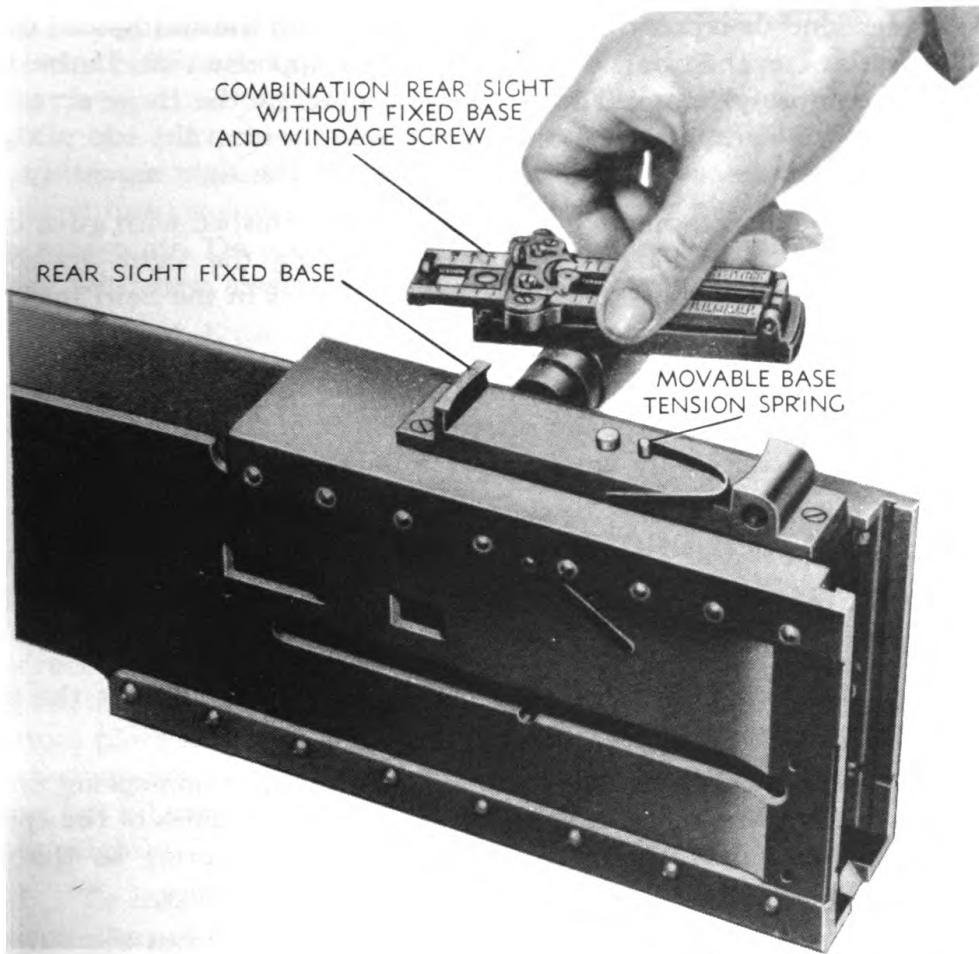


Figure 70 — Unlocking Trigger Bar Pin Assembly



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**Figure 71 — Removing Combination Rear Sight Group from Fixed Base**

from the left-hand side plate of the gun by withdrawing the cotter pin from the nut, unscrewing the nut from the bolt, and removing the bolt from the inside of the receiver. The trigger housing can then be slid rearward in its slot in the receiver and pulled out of the receiver. Assemble the bolt, nut, and cotter pin to the trigger body to hold the slide in position to prevent loss of spring.

h. The combination rear sight should not be removed from the gun unless necessary for replacement or repair. To remove it, turn the windage screw until the teeth at the rear end of the movable base are disengaged from the threads on the windage screw. Then, rotate the base slightly farther by hand and lift straight up and remove it from the fixed base (fig. 71). This will release the movable base tension spring, which can then be lifted from its pivot. The windage screw can be removed from the fixed base by inserting a screwdriver in the slot



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in the end of the screw and then pressing in and turning the knob until released, and then pulling out knob together with the spring and collar. The screw can then be withdrawn from the opposite side. If the sight is to be entirely removed from the gun, unscrew the three screws in the fixed base and lift the entire sight assembly from the top plate. In such an event, a cover plate is substituted for the sight assembly.

**NOTE:** The combination rear sight is not furnished with guns of recent manufacture and present guns mounting the sight are being modified to eliminate it. However, as many guns in the field may still have the sight, it is covered herein.

i. The water jacket group should not be removed from the trunnion block except for repairs or replacement of the alining shim. Removal and disassembly are covered in paragraph 59.

**58. RECEIVER GROUP ASSEMBLY.**

a. If the water jacket has been removed from the trunnion block it may be reinstalled as explained in paragraph 60.

b. If the combination rear sight has been removed from the fixed base, it may be reinstalled as follows:

(1) Place the loop end of the movable base tension spring on the spring stud in the fixed base (fig. 71), compress the sides of the spring, and place the movable base over base stud and spring so that the spring is retained within the recess in the movable base.

(2) Insert the windage screw in the fixed base from the left, and place on the protruding end, the collar, spring, and knob in the order named. Hold the end of the windage screw with a screwdriver and press in the knob to compress the spring, turn knob to the locked position, and then, release the knob. Rotate the movable base by hand until the teeth engage with the threads of the windage screw, and then, turn the windage screw until the base is in position at the "O" reading. The sight can then be adjusted as desired.

c. To install the side plate trigger, remove the nut and bolt from the housing, insert the ramped lug on the forward end of the housing into the forward side plate trigger slot in the left-hand side plate, and slide forward until housing seats level on the side plate. Then, insert the bolt through the side plate and housing so that the ramped lug runs parallel with the housing and engages with ramped cut in inside of side plate. Screw nut on bolt snugly so that the pinhole in bolt and two slots in nut aline, insert cotter pin and spread prongs until flat against nut. Operate slide back and forth in housing to test assembly and operation of cam. Be sure the spring is properly seated at both ends.

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d. To install the trigger bar, place the bar with long end forward and bowed surface upward in the slot between the top plate bracket and the bolt latch bracket. Aline pinholes in brackets and bar, and insert trigger bar pin from the left side of the receiver so that the key lug on the pin enters the keyway in the left-hand side plate. Then, press the pin assembly firmly against the side plate and rotate the lock upward until the projection on the lock seats in the retaining hole in the side plate. Do not force. If the lock is loose when in position, replace with new assembly.

e. To install the breech lock cam, position it in the bottom of the receiver so that the projecting lug on the bottom of the cam projects through the oblong slot in the bottom plate, and the beveled surface of the cam points to the rear. Insert the breech lock cam bolt downward through the cam, and then, thread on the castellated nut so that the cotter pin slots in the nut are against the lower face of the bottom plate. Draw nut tight, backing it off only enough to install the cotter pin through the alined hole in bolt and slots in nut. The nut should be drawn down just tight enough so that the cam will "float" slightly in the receiver, but should not be loose. Measured at the U-shaped opening at the front of the cam, the clearance between the cam and the bottom plate should be between 0.001 inch and 0.008 inch. The design of the cam and method of attachment have been altered from time to time, but all cams are attached in practically the same way and should float slightly.

f. To install the switch (fig. 69), first, insert the bent end of the hairpin-shaped spring into the small hole in the switch recess of the left-hand side plate and snap the spring into recess. Then, slide the rear end of the switch rearward into the recess, holding the switch firmly against the side plate and making sure that the lug on the rear of the switch rides on top of the spring. Push the threaded stud through the stud hole in the side plate and screw on the nut snugly, and secure with cotter pin. Spread prongs of cotter pin around nut, and test switch for proper action. It should pivot easily when depressed and snap back into position when released. The shoulder on the stud prevents the nut from drawing the switch against the side plate sufficiently to cause binding. When assembled, the switch should neither bind nor have more than perceptible side play. If the latter is the case, adjust or replace the switch with a new one if necessary.

g. If the cover detent pawl has been removed, it may be reinstalled by slipping the pawl spring onto the spring guide and inserting spring and guide into the detent pawl hole in the rear top of the trunnion block.

h. To assemble the gun for *left-hand* feeding as when used with mounts covered herein, the front cartridge stops and right-hand rear

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cartridge stop assembly composed of an integral stop, link stripper, and cartridge alining pawl, are installed on the right side of the trunnion block and the belt holding pawl on the left side as described below (fig. 66). When the gun is assembled for *right-hand* feeding, the position of the parts is reversed and a separate rear cartridge stop and link stripper are substituted for the right-hand rear cartridge stop assembly. Such parts may also be used for assembly for left-hand feeding, but the above assembly functions best and should be used when available. The assembly can only be used when assembled to the right side of the gun. (Guns may be issued with both sets of parts assembled to the gun for safe keeping. Such extra parts should be removed from the gun.) To assemble these parts for *left-hand* feeding:

(1) Insert the right-hand rear cartridge stop assembly in the rear slot in the holding bracket on the right-hand side of the trunnion block so that the link stripper points to the left. Then, insert one of the belt holding pawl pins through the holding bracket and stop from the rear. (The separate stop and link stripper are assembled similarly when used. The stop and stripper should not bind in their seats; also the lower prong of the stripper should not rise above the bar behind it. Such faults should be corrected by filing lightly.)

(2) Insert front cartridge stop into the forward slot in the same bracket so that it points to the left, and push pin all the way through. ("FRONT" is stamped on this stop.) Be sure the retaining spring is properly seated in the end of the pin.

(3) Seat the belt holding pawl spring (or springs) in seat in the left-hand holding bracket and place the pawl upon the spring so that it faces to the right and the spring seats securely in bracket and pawl. Depress pawl on spring (or springs), and push belt holding pawl pin through bracket and pawl. Check pin retaining spring as in step (2) above.

**NOTE:** Guns of recent manufacture are assembled with twin belt holding pawl springs instead of a single spring. The belt holding pawl and brackets are designed to seat these springs. The twin springs are cadmium plated, have a maximum operating load of 7 pounds plus or minus  $\frac{1}{2}$  pound, and  $12\frac{1}{2}$  coils. The old single spring has a maximum operating load of 16 pounds plus or minus 3 pounds, and  $10\frac{1}{2}$  coils. Care must be observed when replacing springs or pawl to assemble correct parts. The twin springs A153146 and corresponding pawl B261098 can only be used with guns having belt holding pawl brackets with twin seating recesses for the springs. Such brackets are numbered B128730-20 and above (right-hand), and C4059-18 and above (left-hand). When replacing spring and pawl in guns having left-hand and right-hand brackets B128730 and C4059 with a single spring seating recess, the old style spring A9522 and pawl B8916 must be used.

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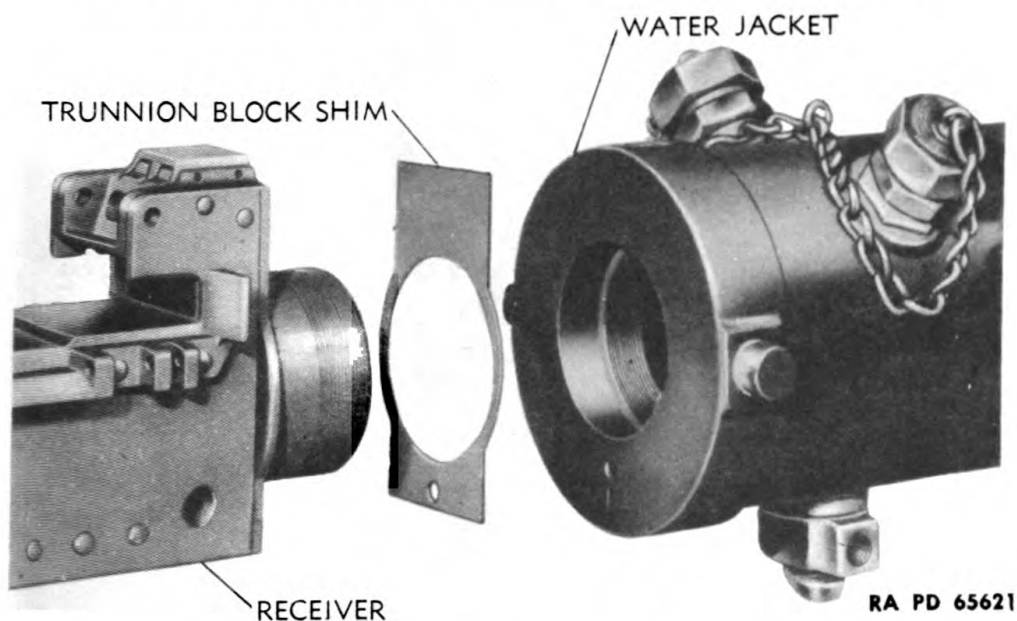


Figure 72 — Water Jacket Group Removed from Trunnion Block

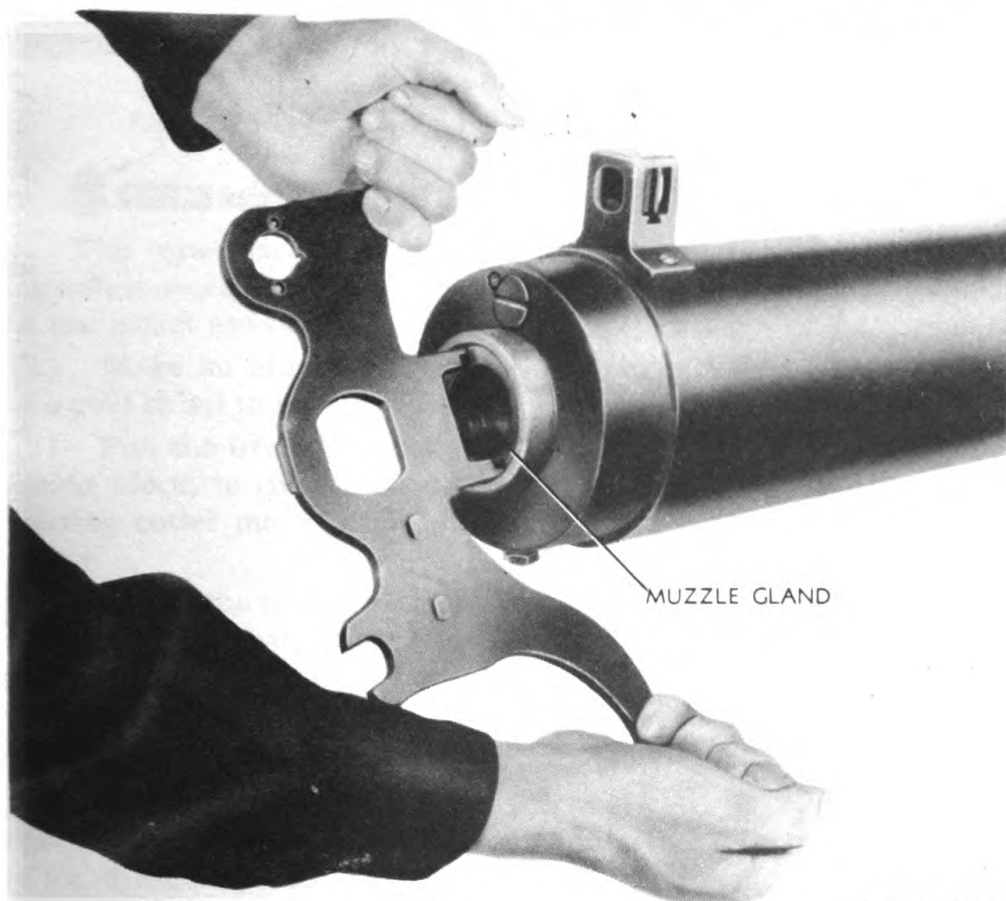
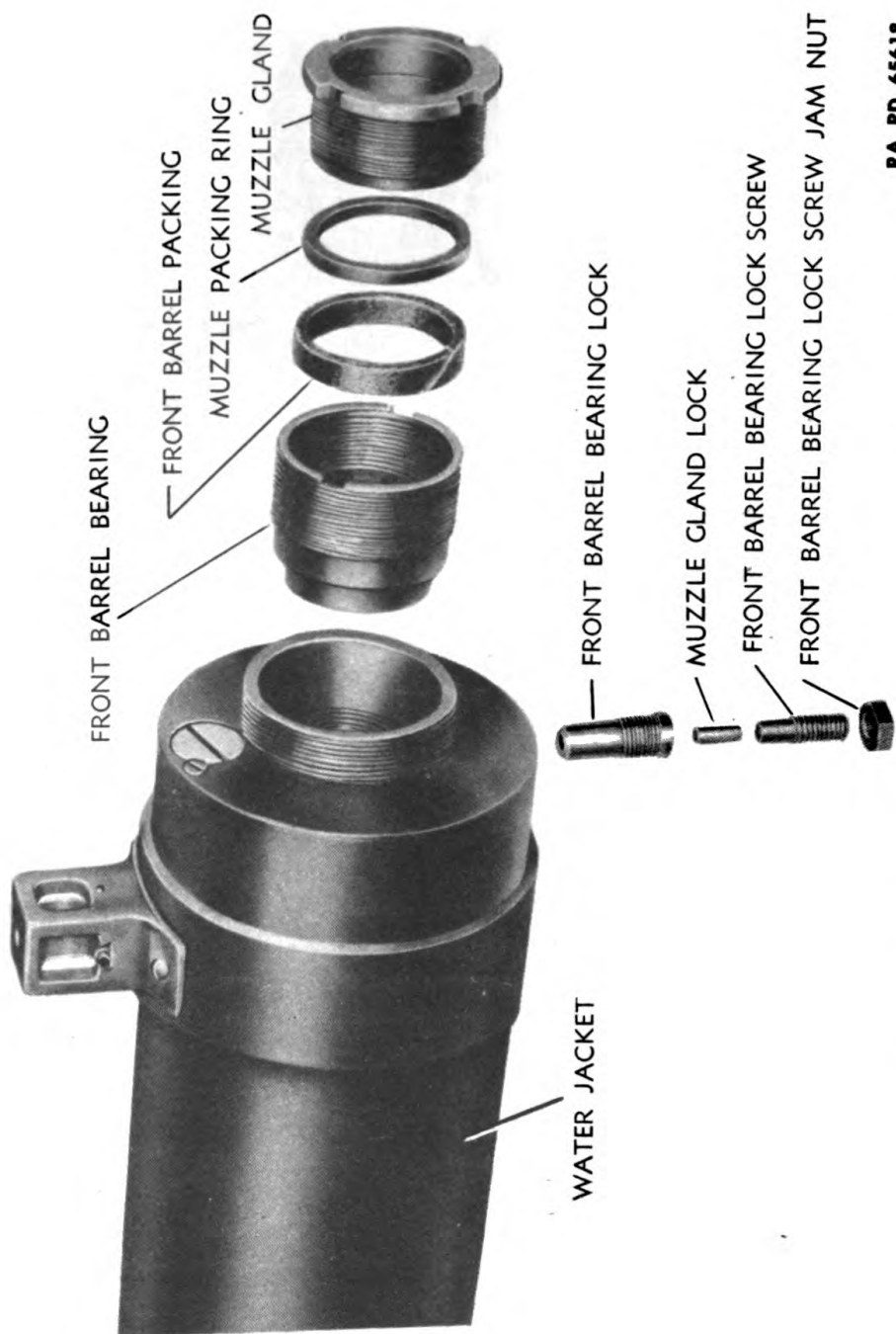


Figure 73 — Unscrewing Muzzle Gland

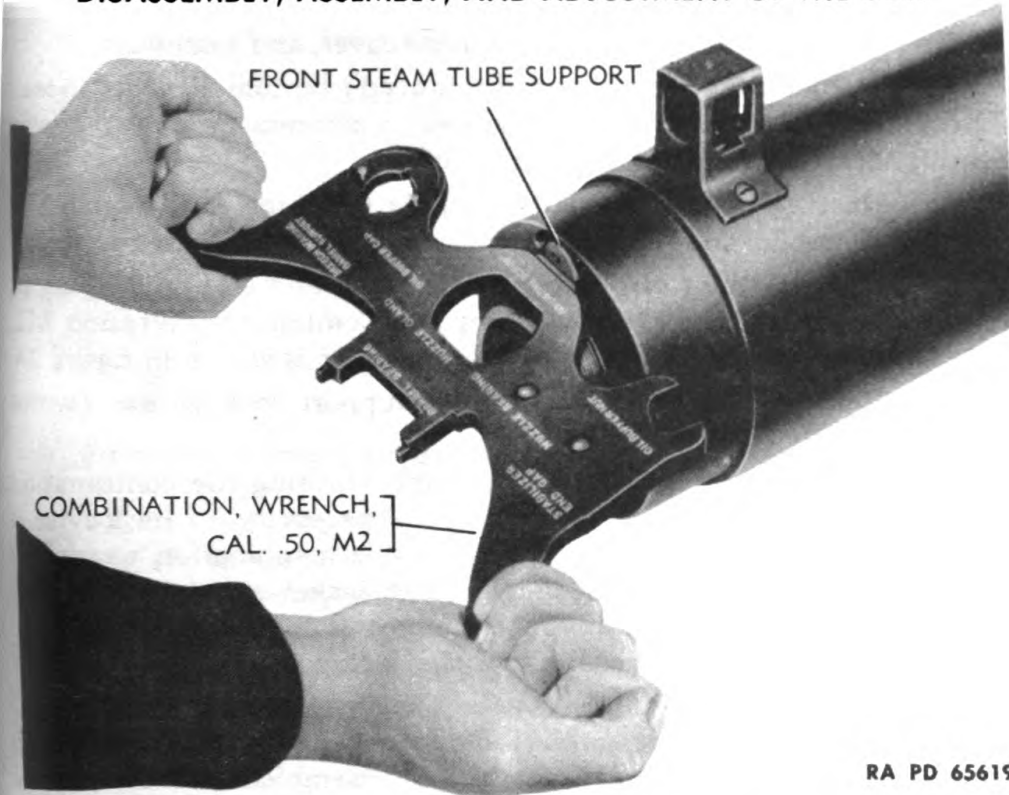
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Figure 74 — Front Barrel Bearing Group — Exploded View

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RA PD 65619

**Figure 75 — Removing Front Steam Tube Support**

## 59. WATER JACKET GROUP DISASSEMBLY (fig. 74).

a. The water jacket should not be removed from the trunnion block unless necessary as disassembly and packing can be accomplished with the jacket assembled to the trunnion. To remove jacket:

(1) Make an alining mark on water jacket and trunnion block with a cold chisel to assist in alinement when reinstalling the jacket.

(2) Pull the trunnion block lock, located in the under side of the trunnion block, to the rear and give it one-quarter turn so that the projecting cotter pin will hold it out of engagement with the water jacket.

(3) Clamp the trunnion block firmly in a vise, and using the strap pipe wrench shown in figure 137, unscrew the water jacket from the trunnion block counterclockwise (fig. 72).

(4) Remove the alining shim, and then, if necessary, pull out cotter pin and remove trunnion block lock and spring.

b. As there are no moving parts in the water jacket except the steam tube (in water jackets of early manufacture), there is no necessity for disassembly except to repair leaks and replace the muzzle packing, or clean the steam tube when it does not slide freely. Disassembly can be accomplished as follows:

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- (1) Unscrew the front end cap thread cover, and remove.
- (2) Turn the gun (or jacket, if removed) bottom side up, loosen the front barrel bearing lock screw jam nut, and remove the front barrel bearing lock screw and muzzle gland lock.
- (3) Unscrew the muzzle gland using the Combination Wrench M2, shown in figure 73, and remove the muzzle packing ring and packing.
- (4) Unscrew the front barrel bearing lock and after removing it, unscrew the front barrel bearing using the Combination Wrench M2. Disassembled view of front barrel bearing group is shown in figure 74.
- (5) Remove the front steam tube support lock screw (water jackets of early manufacture).
- (6) Loosen the front steam tube support, using the combination wrench as shown in figure 75. It may be necessary to improvise a large screwdriver to remove the piece if the combination wrench is not adequate. The front end of the water jacket should be slanted downward, as the front steam tube support is loosened, so that the steam tube will slide forward out of the jacket as the front support is loosened and removed (fig. 76).
- (7) Water jacket assemblies of recent manufacture (45-inch barrel) have a fixed steam tube which is assembled at manufacture and should not be removed. Such jackets are distinguished by the absence of the front steam tube support in the front end cap of the water jacket.
- (8) Remove the front sight stop screw and unscrew the front sight set screw about  $\frac{1}{8}$  inch. Rotate the front sight adjusting screw in a counterclockwise direction forcing the front sight cover assembly out of the left side of the front sight base. The base should not be removed from the water jacket.

**60. WATER JACKET GROUP ASSEMBLY (figs. 74 and 76).**

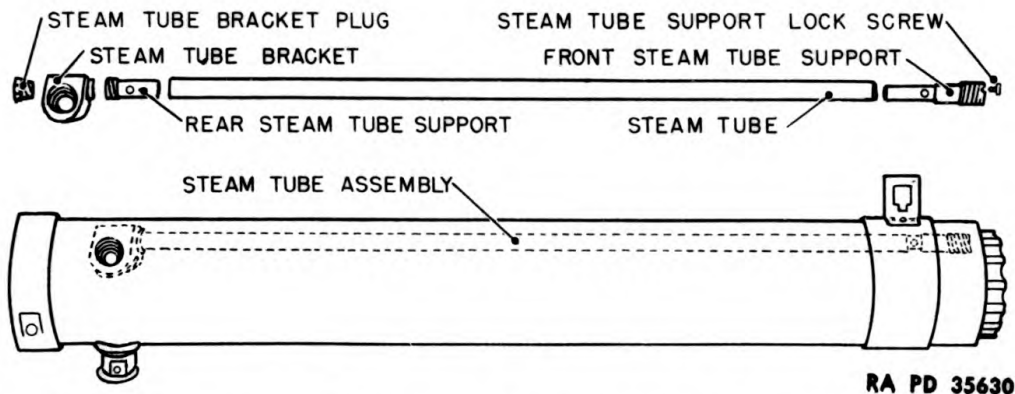
a. If the water jacket assembly has been removed from the trunnion block it may be reinstalled as explained below. If the jacket has been disassembled it should be assembled before assembling to the trunnion block, as described in subparagraphs b through e below.

(1) Place the trunnion block lock spring over the lock, and insert the lock in the hole in the trunnion block from the front. Push back to the rear and insert cotter pin and spread prongs (use new cotter pin, if possible). Give lock a one-quarter turn in either direction and the cotter pin will hold the lock in the rearward position. See that cotter pin is in good condition, properly spread, and not bent, for reasons explained in paragraph 67 i (3).

(2) When the water jacket is reinstalled after removal, it is usually necessary to use an alining shim of the next higher number than the one previously used in order to bring the water jacket to



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**Figure 76 — Steam Tube Assembly (Exploded View) and Location in Water Jacket**

proper alinement with respect to the trunnion block. Place the proper shim in position against the trunnion block lock hole down, apply an even coating of white lead to the threads of the trunnion block, and screw on the water jacket. Using the strap wrench, tighten the jacket until the alinement marks on trunnion block and water jacket, made before removal, register. If alinement cannot be accomplished when the assembly is sufficiently tight, remove and replace the shim with one of the proper thickness to accomplish the alinement. Tightness of the water jacket on the trunnion block must not be neglected for alinement. The front sight should be centrally alined with the top of the trunnion block and receiver when the water jacket is assembled. The shim must be held from shifting while the jacket is being screwed on so that the hole in the shim will aline with the trunnion block lock.

(3) Give the trunnion block lock a one-quarter turn to release it, and make sure that it passes through the shim and seats properly in the rear end cap of the water jacket.

b. Insert the front sight cover assembly through the left side of the front sight base so that the front sight blade points to the rear. Engage the front sight adjusting screw and rotate it in a clockwise direction to bring the assembly into proper position. Tighten the front sight set screw, and lock it with the front sight stop screw.

**NOTE:** If it is necessary to fire the gun using the combination rear sight, and the front sight is found to be out of alinement, it may be alined as follows: Place the gun on a 1,000-inch target range having a target marked off with a vertical line 1-inch wide and 20-inches long. With the rear sight set at 700 yards, and the windage on zero, aline gun on center of target and fire a burst of 10 rounds; if shots go to right of line, loosen front sight set screw, and turn front sight adjusting screw in a clockwise direction; if shots go to left of line, turn adjusting screw counterclockwise. Tighten front sight set



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screw, re-lay, reload, and fire. Repeat this operation until proper alignment is obtained and the shot group is centered.

c. Place the water jacket (and gun if assembled) in a vertical position with the front end up. Carefully insert the steam tube (guns of early manufacture) into its hole in the front end cap of the water jacket, so that its lower (rear) end slips over the rear steam tube support. (If a thin rod is available, it can be used to guide the steam tube into position.) When the rear end of the tube is seated, guide the front steam tube support into position inside the steam tube and screw it tightly into the front end cap, using the Combination Wrench M2 (fig. 75), or improvised screwdriver. When the notch in the support is properly positioned, screw in the front steam tube support lock screw.

d. Screw the front barrel bearing into the end cap until the hole in the bearing lines up with the hole for the front barrel bearing lock. (If a new bearing is being used, the hole must be drilled in the bearing after the bearing is properly screwed into position.) Then, insert the front barrel bearing lock and set it tight.

e. Insert the front barrel packing, pressing it firmly into its seat and insert the muzzle packing ring. Screw the muzzle gland firmly but not tightly against the ring using the Combination Wrench M2 (fig. 73). Then insert the muzzle gland lock in the bearing lock and behind it the bearing lock screw, screwing it tightly, and locking it with the front barrel bearing lock screw jam nut. Then, screw the front end cap thread cover onto the front and cap. (The muzzle gland should not be screwed in tightly until gun is fully assembled, at which time the packing should be adjusted to prevent leakage without unnecessary binding with the barrel.)

**61. RETRACTING SLIDE GROUP DISASSEMBLY (fig. 77).**

a. Remove the retracting slide lever and spring from the bracket by pulling out the cotter pin and removing the nut and washer.

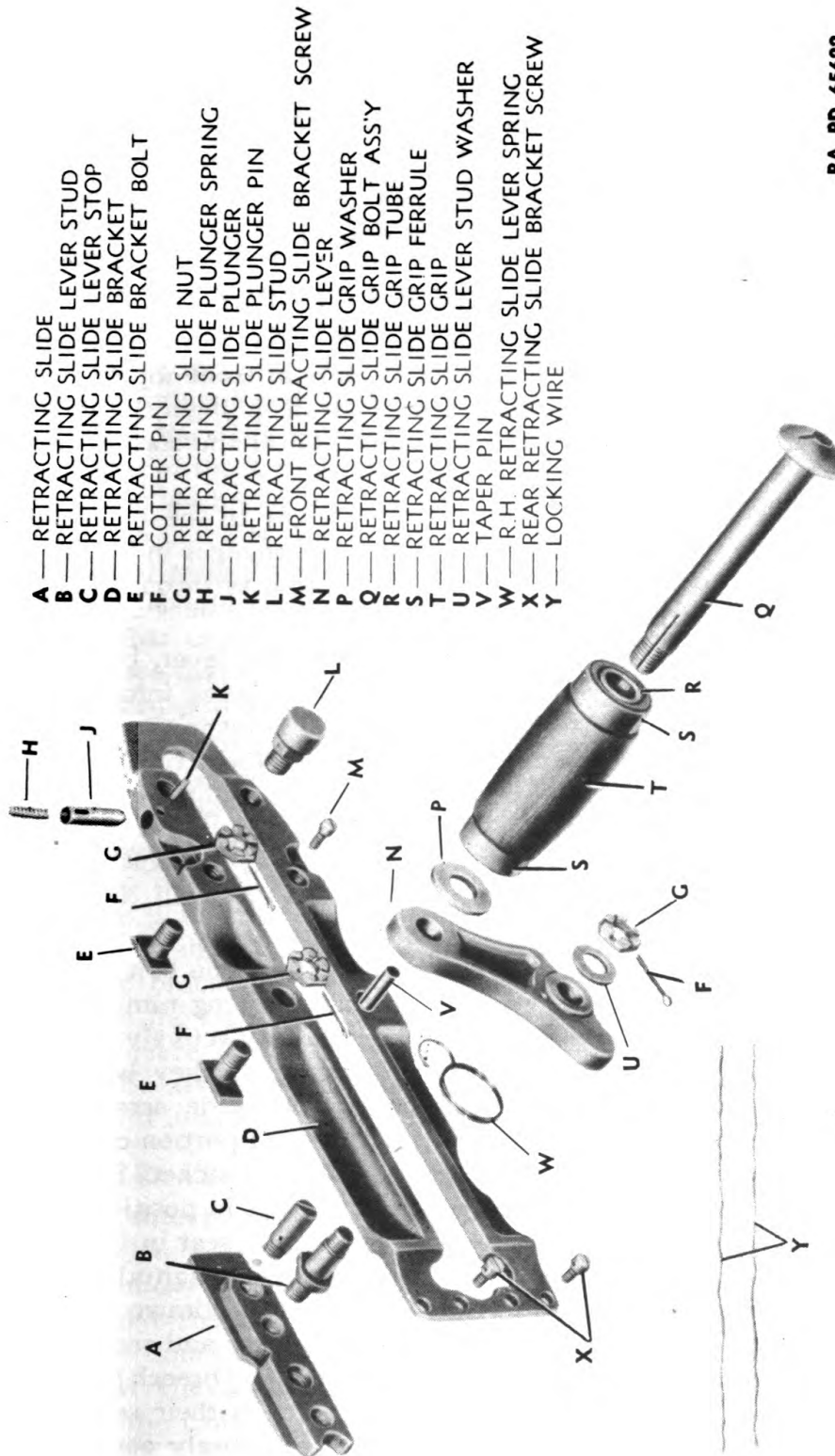
b. The grip and related parts may be attached to the lever in one of two ways, as follows:

(1) In some cases, they are attached to the lever by means of a solid bolt, staked in place. In such a case, remove the parts by unscrewing the bolt with a large screwdriver, forcing the staking.

(2) In some cases, they are attached by means of a hollow bolt with a split threaded end, into which a tapered pin is fitted. In such a case, before the bolt is unscrewed, a slender rod must be inserted in the hole in the bolt, and the tapered pin driven out.

c. Withdraw the cotter pins, unscrew the nuts from the slide bracket bolts, and remove the bolts from the inside of the receiver. Then, withdraw the locking wires from the front and rear bracket

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Figure 77 — Retracting Slide Group Assembled for Right-hand Installation — Exploded View

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screws, unscrew and remove the screws. The bracket assembly may then be removed from the side plate of the receiver and the slide assembly lifted out of the bracket.

d. The retracting slide plunger and spring are pinned in the bracket and should not be removed unless necessary. To remove, drive out pin and remove plunger and spring. Hold thumb over spring to prevent loss when removing pin.

e. The lever stop in the slide, and the slide stud in the lower member of the bracket should not be removed.

**62. RETRACTING SLIDE GROUP ASSEMBLY (fig. 77).**

a. If the retracting slide plunger has been removed from the bracket, insert plunger, point leading, in hole in front top of bracket. Insert spring in plunger, align pin slots in plunger, pinholes in bracket, and insert pin so that it bears on top of the spring. Depress spring with punch while inserting pin.

b. Place the slide assembly in the slideway in the inner side of the bracket so that the plunger in the bracket engages in the V-notch in the top of the slide, and the lever stud projects through the elongated stud slot in the bracket.

c. Assemble the grip washer and grip to the lever, by inserting the grip bolt through grip and washer, and screwing into the lever, so that the lug on the bottom of the lever will point to the rear (wide end of bracket) when assembled to the slide stud. If the bolt is of the hollow, split-end variety, drive the taper pin tightly into the bolt to spread and hold the threads. If of the solid variety, stake the bolt into the lever with a small punch. In either case, the bolt should be screwed into the lever sufficiently so that the grip will just revolve easily without binding.

d. Insert the front and rear bracket bolts into the bolt slot in the right-hand side plate of the receiver so that the long ramped end of the lug on each bolt faces to front and rear respectively and away from each other. Move the bolts apart as far as they will go and then position the retracting slide bracket, with slide assembled, on the side plate of the receiver so that the threaded portion of the bolts enter the bolt holes in the top member of the bracket. Screw nuts on bolts and draw down sufficiently to hold bolts in position. (When assembled, the ramped end of the bolt lugs should seat in the ramped slots in the inner face of the side plate to prevent longitudinal movement of the bracket.) The bolt nuts should not be drawn tight until the bracket screws have been positioned in bracket and receiver. The bracket bolts are best positioned by sliding the (breech) bolt into the rear end of the receiver to hold the bolts in their seats in the side plate while assembling. One bolt may be loosely assembled in the bracket, if desired, to facilitate assembly.

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e. Screw in front (long) and rear (short) bracket screws and draw down tight, alining holes in head of screws so that locking wires will run through easily. Thread one locking wire through the two rear bracket screw heads, draw tight, twist ends, and fold in. Thread the other wire through the front screw head and the hole in the slide stud and fasten likewise. Then, tighten nuts on bracket bolts, aline pinholes, insert cotter pins, and spread prongs. Bend prongs snugly around nut to prevent any interference. Be sure the *long* bracket screw is assembled in the *front* hole, and that screws do not protrude into receiver to interfere with removal or installation of oil buffer group.

f. Position the right-hand lever spring over the lever stud in the slide so that the small loop of the spring is around the slide lever stop in the forward end of the slide and the bent end is facing outward. Then, place the lever on the lever stud in the slide and insert the bent end of the spring into the small hole in the inner face of the lever. Place washer over protruding end of stud, thread on nut, tighten, aline pinholes, and install cotter pin. Spread prongs of cotter pin and bend snugly around nut. When so assembled the lower end of the lever should bear upon the near face of the slide stud in the lower member of the bracket. Test slide by retracting and moving forward to see that the slide is properly retained by the plunger when in the forward position.

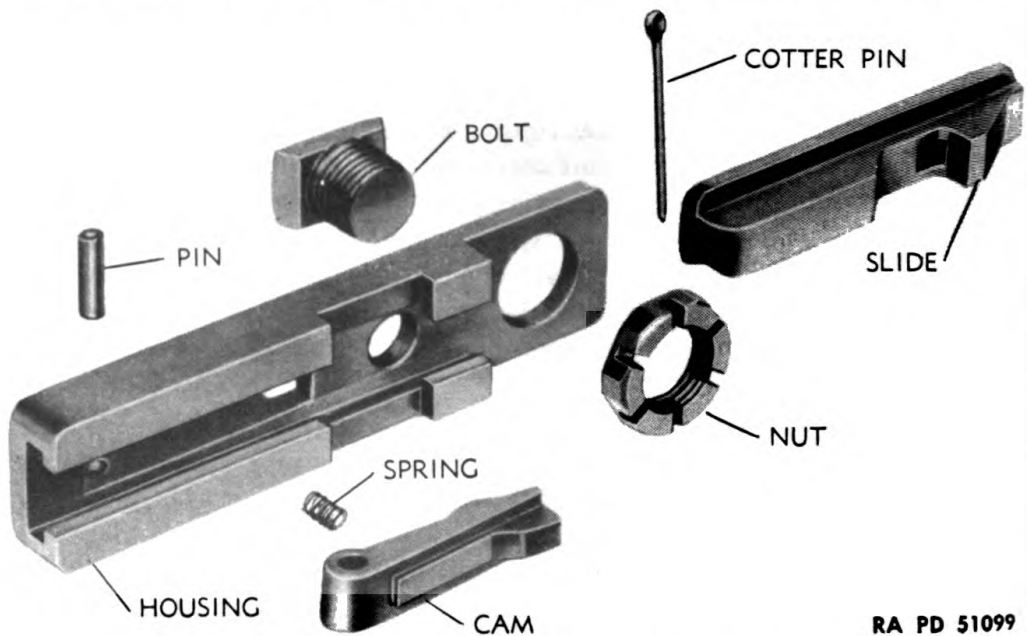
g. The retracting slide assembly is always mounted on the *right side* of the gun as described above, when used with mounts covered in this manual. When mounted on the left side of the receiver the grip is assembled to the opposite side of the lever, and a left-hand lever spring is used. The side plate bracket is vertically reversed so that the plunger is on the bottom instead of on the top, and the retracting slide stud is assembled to the (now) lower member of the slide bracket. Otherwise the assembly is the same as when mounted on the right side. However, when mounted to the left side, the thumb piece of the cover latch shaft and the back plate latch lock must be assembled to the right side of their respective assemblies to avoid interference, as already explained.

### 63. SIDE PLATE TRIGGER GROUP DISASSEMBLY (fig. 78).

a. The side plate trigger assembly should not be disassembled except for cleaning or repair. To disassemble:

- (1) Remove nut and bolt from housing.
- (2) Move the slide to the rear (over bolt hole) out of housing, at the same time holding thumb over cam to prevent it from springing up when relieved and the spring flying out.
- (3) Allow cam to rise slowly, then swing upward and remove spring.
- (4) Drive pin out of housing and remove cam.

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**Figure 78 — Side Plate Trigger Assembly — Exploded View**

**64. SIDE PLATE TRIGGER GROUP ASSEMBLY (fig. 78).**

a. If the side plate trigger assembly has been disassembled, it may be assembled as follows:

(1) Position trigger cam in top of housing so that pinholes aline and spring seat in cam faces spring seat in bridge of housing. Insert pin and drive through until flush with both faces of the housing.

(2) Insert small pin or thin wire through small hole in bridge of housing and place spring on end of pin or wire, then, fold cam down on spring so that the end of wire enters the spring seat in the cam. Depress cam on spring, thus pushing wire out of housing and hold down in position. Be sure both ends of spring are fully seated.

(3) Holding cam down on spring, insert notched end of slide in guideways of the housing from the front (solid) end, and push to rear over cam until it snaps into position.

(4) Insert bolt through bolt hole in bottom of housing, screw on nut, and replace cotter pin to prevent loss of parts.

**CAUTION:** Be sure the side plate trigger spring is properly seated at both ends; otherwise it will work loose and fly out when the gun is operated, or will jam the trigger. If spring is deformed, replace with new spring.

b. Test action of trigger by pushing the slide backward and forward in the housing. The slide should remain fixed in either position, and the cam should protrude from the housing when the slide is to the rear and recede into the housing when the slide is in the forward position.

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### 65. PACKING THE BARREL.

a. Drain the water jacket and remove the barrel assembly from the gun (par. 43). The cooling liquid should be preserved when necessary. The rear (breech) barrel packing is seated in a groove in the rear end of the barrel (fig. 62); the front (muzzle) barrel packing is seated in a groove in the front barrel bearing in the water jacket front end cap (fig. 74).

#### b. To Pack the Breech End.

(1) Unscrew the packing adjusting ring, remove the old rear barrel packing, and clean out the packing recess in the barrel.

(2) Insert new rear barrel packing in the packing groove and smooth into place until the ends meet. Screw adjusting ring against packing just tight enough to hold it firmly in place.

#### c. To Pack the Muzzle End.

(1) Remove the thread cover from the front end cap of the water jacket.

(2) Unscrew the front barrel bearing lock screw jam nut and front barrel bearing lock screw, and remove screw and muzzle gland lock.

(3) Unscrew and remove the muzzle gland, using the Combination Wrench M2 (fig. 73), remove the muzzle packing ring and old front barrel packing, and clean out inside of front barrel bearing.

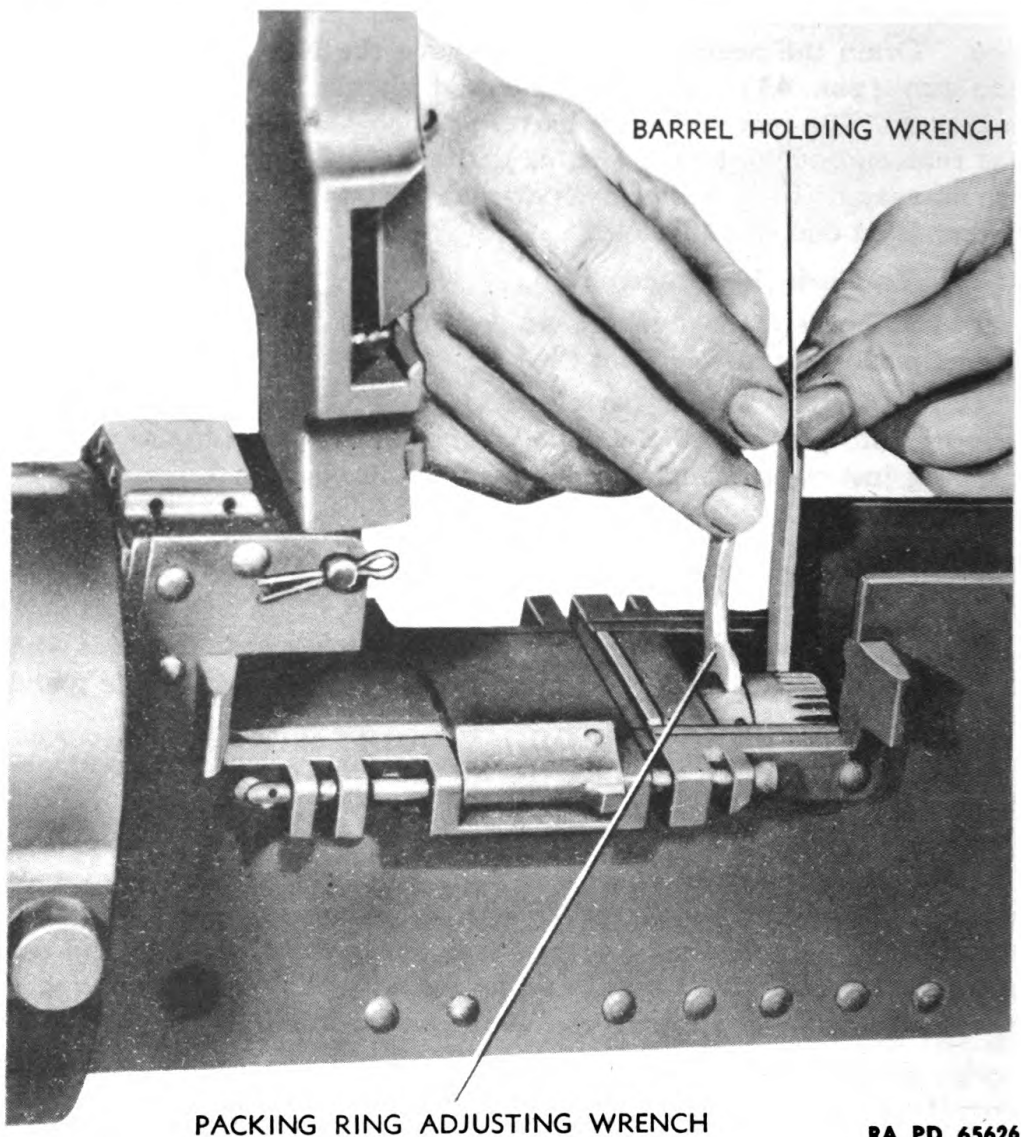
(4) Insert new front barrel packing, smooth into place until ends meet, and reinstall muzzle packing ring and muzzle gland. Screw in the muzzle gland against ring just sufficiently to hold packing in position, as it must be adjusted and locked in place after the barrel is reassembled in the gun and the water jacket filled.

d. Reassemble the barrel assembly to the barrel extension and re-install the groups into the gun (par. 44) being careful not to injure the barrel packing. The barrel should be screwed out of the barrel extension eight notches to be sure that the recoiling parts will go fully forward into battery, before adjusting barrel packing. This is necessary so that binding due to improper headspace adjustment may not be confused with that due to tight barrel packing.

e. Adjust front barrel packing (muzzle packing) by tightening or loosening the muzzle gland; then lock the gland in place with the muzzle gland lock, front barrel bearing lock screw, and jam nut, assembled in the order named, and screw on the thread cover.

f. Adjust rear barrel packing (breech packing) by tightening or loosening the adjusting ring, using the barrel packing ring adjusting wrench and holding wrench (fig. 79). The holding wrench is for the purpose of holding the barrel in position while turning the adjusting ring with the ring adjusting wrench. The barrel can be held re-

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PACKING RING ADJUSTING WRENCH

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**Figure 79 — Adjusting Rear Barrel Packing with Special Wrenches**

tracted while adjusting by engaging the lug on the extractor with the bolt stop projecting from the left-hand side plate.

g. Packing should be adjusted so that it bears snugly against the barrel without undue binding when the gun is hand-operated. Fill the water jacket, hand-operate the gun, and check for leaks. Packing should be carefully watched and if necessary adjusted especially after the initial firing of the gun. Packing should be no tighter than necessary to prevent leaking.

h. After gun is assembled and packing adjusted, adjust and check headspace as explained in paragraphs 45 and 46.

**DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN****66. CHANGING BARRELS.**

a. Open drain valve and drain the cooling liquid from the water jacket into the water chest or other suitable clean receptacle. (If antifreeze mixture is being used, it should be preserved.)

b. Remove back plate, driving spring rod, and bolt groups from the receiver. Then, remove barrel, barrel extension, and oil buffer group by unlocking from receiver and pulling to the rear out of receiver (par. 43).

c. Remove oil buffer group and unscrew the old barrel assembly from the barrel extension, and replace with new barrel assembly. Be sure rear barrel packing is in good condition and properly assembled. Also be sure that the rear end of the new barrel extends slightly into the barrel extension when screwed all the way in (par. 54 c).

d. Reassemble barrel, barrel extension, oil buffer, bolt, driving springs, and back plate groups to the gun (par. 44). Care must be exercised when assembling the barrel not to disarrange the barrel packing. For checking of new barrel refer to paragraph 25 a (10) (b) 3.

e. Close drain valve and refill water jacket with cooling fluid used, and adjust breech and muzzle packing as explained in paragraph 65. Observe care that packing does not bind barrel unnecessarily. After adjusting packing, adjust and check headspace as prescribed in paragraphs 45 and 46.

f. If it is necessary to retain the cooling fluid in the water jacket when changing the barrels the following method can be employed:

(1) Remove back plate, driving spring rod, and bolt groups from the receiver.

(2) Screw union caps to inlet and outlet openings in the water jacket and lower the muzzle of the gun to prevent loss of cooling fluid at the rear end.

(3) Hold a tapered plug of proper size at the muzzle of the barrel, and withdraw oil buffer, barrel extension, and barrel group to the rear out of the receiver. As the barrel is withdrawn, follow it with the plug and insert the plug into hole in muzzle gland through which the barrel has been withdrawn.

(4) Place a plug or twisted patch in the muzzle of the new barrel. Unscrew old barrel from the barrel extension and replace with new barrel as explained in subparagraphs c and d above. Then, reassemble the barrel, barrel extension, and oil buffer groups into the gun. When the muzzle of the new barrel passes through the hole in the muzzle gland, remove the plug from the hole.

(5) Remove plug in barrel and run a few gun-cleaning cotton patches through the barrel, and if gun is not to be used immediately, a



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lightly oiled patch. Oil, however, must be entirely removed with dry patches before firing (par. 30 d). Then, reassemble the bolt, driving spring rod, and back plate groups to the gun.

(6) Adjust breech and muzzle packing if necessary to prevent leakage as prescribed in paragraph 65. Packing should not bind barrel unnecessarily when gun is manually operated, and should be inspected after the initial firing and if necessary adjusted as it will wear in somewhat.

(7) Make and check headspace adjustment as prescribed in paragraphs 45 and 46. Headspace must be checked each time after the packing has been adjusted.

**67. POINTS TO BE OBSERVED WHEN ASSEMBLING.**

a. **General.** The assembly of the gun as described herein is for *left-hand* feeding. As it is possible to assemble various parts in more than one way, as when assembled for right-hand feeding, the assembled gun should be thoroughly checked to see that such parts are in their proper position, and the gun, as a whole, properly assembled for left-hand feeding which is the only way in which it can be used with the mounts covered herein. Important points to observe when assembling, and to be checked with regard to the assembled gun, are given below. For convenience these points are taken up for each group of parts assembled, and then for the assembled gun. The points to be observed are briefly indicated, for particulars refer to the paragraph on assembly of the group.

b. When reinstalling groups observe the following points:

(1) See that barrel packing is smoothed into position, and that the barrel extends slightly into the barrel extension when screwed all the way in. The recoiling parts will probably not go all the way forward into battery when assembled with the barrel screwed all the way in, until the headspace adjustment has been made.

(2) See that cover is raised before reinstalling groups.

(3) See that front and rear barrel packing are not disturbed when inserting barrel into receiver and water jacket.

(4) See that barrel extension is fully locked to oil buffer and tips of accelerator pressed back.

(5) See that oil buffer body is fully locked in receiver, lock fully seated, and oil buffer tube pushed fully forward in buffer body.

(6) See that cocking lever is in the forward position and the extractor down when reinstalling the bolt.

(7) See that driving spring rod retaining pin is fully engaged in locking hole in the right-hand side plate.

(8) See that driving spring rod and oil buffer tube are pushed

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

fully forward, oil buffer adjusted, and the back plate latch lock is disengaged when reinstalling the back plate, and that latch and latch lock are fully engaged when in place.

(9) See that the back plate adjusting screw is screwed in tightly against the buffer disks and protrudes not less than  $\frac{1}{16}$  inch (par. 48 a (8) ), and that the buffer plate protrudes through the back plate approximately  $\frac{3}{16}$  inch.

### c. Back Plate Group.

(1) See that lower filler piece is assembled with extension to *left* and latch lock assembled on *left* side of piece.

(2) See that all pins are fully seated, cotter pins in place, and prongs properly spread.

(3) See that back plate adjusting screw plunger and spring are in position in the screw, and screw is turned tightly against buffer disks and projecting not less than  $\frac{1}{16}$  inch. Buffer disks should be seated level upon each other, and tube and disks clean. Buffer plate should protrude through the back plate approximately  $\frac{3}{16}$  inch.

(4) See that safety and (hand) trigger function properly, and safety is not loose.

### d. Bolt Group.

(1) See that ejector pin is fully seated flush in extractor with ejector pointing in same direction as the extractor pivot stud.

(2) See that extractor is seated in bolt with shoulder engaged with undercut.

(3) See that bolt switch stud is seated in bolt with small diameter up and bolt switch is seated over stud so that the narrow side of the switch faces to *rear* and groove coincides with groove in bolt marked "L."

(4) See that firing pin spring stop pin in firing pin extension is seated flush in the extension.

(5) See that sear stop is fully engaged in undercut in bolt.

(6) See that cocking lever pin head is on *left* side of bolt, and seated flush in the bolt. Pin of recent design has small head but *must* be assembled from the *left side* or the gun will not function properly.

(7) See that sear spring is seated level in bolt, and sear and sear slide is assembled with long square end pointing to *left*, and notch down, engaging lug on sear.

(8) See that cocking lever is assembled with curved cam surface to the *rear*.

(9) See that firing pin and driving spring rod tunnels are clean free from oil and grease, and that groups are not bent and do not bind

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

**e. Oil Buffer Group.**

- (1) See that buffer tube is properly filled with proper oil according to instructions in paragraph 36.
- (2) See that filler screws, relief valve, and cap are screwed in tight.
- (3) See that piston head nut is properly set and secured by pin to give proper clearance with the piston valve.
- (4) See that notch in piston rod is facing *up*, key on spring guide is to right and teeth on tube down, when tube is assembled in body, and that over-all dimension of buffer when assembled is within prescribed limits.
- (5) See that body spring lock is staked in place and tube lock is properly retained, and not binding, nor short.
- (6) See that gland packing is properly assembled, adjusted, and not binding unduly, and that there is no oil leakage.
- (7) See that accelerator is assembled with tips pointing up and to rear, pin is flush with faces of body, and spring in place in pin.

**f. Barrel and Barrel Extension Group.**

- (1) See that packing in rear end of barrel is properly adjusted and held in place by adjusting ring.
- (2) See that barrel locking spring is fully seated, not bent, and nose of spring and notches in barrel are clean and sharp so that they will engage properly.
- (3) See that breech lock is assembled with double bevel up and facing *forward*, pin is seated evenly, and spring in place in pin.
- (4) See that barrel extension shank lock pin is flush with both faces of barrel extension; and hook on shank faces *down*.

**g. Cover Group.**

- (1) See that cover latch shaft lever is on left side when assembled.
- (2) See that cover latch is assembled with long lug to rear and towards cover.
- (3) See that cover extractor spring is fully engaged in undercut in cover extractor cam, that cover latch spring is bearing on latch and cover extractor spring, and hooked end seated in transverse groove in cover.
- (4) See that cotter pin in cover latch shaft is spread around shaft.
- (5) See that belt feed pawl is on left side of slide pointing to the right and arm is positioned on side of pawl nearest cover latch and pointing to the right.
- (6) See that belt feed lever plunger and spring are seated in the hole in lever nearest the latch end of the cover, and the spread cotter pin is holding the lever in place on the stud.

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

### h. Receiver Group.

(1) See that the right-hand rear cartridge stop assembly (or rear cartridge stop and link stripper, if assembled), and front cartridge stop are assembled on the right side of the trunnion block and the belt holding pawl on the left.

(2) See that the proper spring or springs are securely seated under the belt holding pawl as explained in paragraph 58 h (3), and that there is no foreign matter under pawl.

(3) See that the switch spring is fully seated, the nut tight, cotter pin properly spread, and that switch does not bind or have excessive side play.

(4) See that the trigger bar is assembled with long end forward and bow facing up.

(5) See that retracting slide is assembled to *right* side of receiver with right-hand lever spring assembled, bolts and screws are tight, and locking wires and cotter pins are properly secured.

(6) See that side plate trigger (when assembled) is securely bolted in place on *left* side of receiver and cotter pin in place and spread around nut.

(7) See that combination rear sight (if assembled) is secure on top plate of receiver and functions properly.

(8) See that trunnion lock is in place, cotter pin properly spread and not bent.

(9) See that the trigger bar does not drag on the bolt when the trigger is depressed. This can be checked with an 0.005-inch feeler gage, with the bolt retracted about 1½ inches out of battery. If bar drags, it should be replaced with one that does not.

### i. Water Jacket.

(1) See that hose connection bushings and drain valve are tight.

(2) See that front packing is smoothed in place, bearing lock is tight and properly secured, and packing gland tight enough to hold packing pending adjustment.

(3) See that water jacket is tight and alined with trunnion block, and trunnion lock is fully engaged. Cotter pin should be spread sufficiently for retention but not wrapped around lock. Take care that cotter pin is in good condition and not bent when assembled and does not cam out while lock is engaged, otherwise the lock cannot be disengaged from the water jacket nor be held in disengaged position by the cotter pin bearing on the shoulder in the trunnion block, when turned.

(4) See that front sight group is securely in place.

(5) See that the movable steam table (in guns of early manufacture) slides freely on its supports in the jacket, and that the front support is locked in position.

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

### j. Retracting Slide.

(1) See that plunger stop pin is in position over spring, and plunger operates properly.

(2) See that the two *short* bracket screws are in the two *rear* holes. If the long screw is assembled in one of the rear holes, it will interfere with the oil buffer body when assembled. Check to see that the screws do not enter the receiver when assembled.

(3) See that lever stud and stop are secure in the slide, the lever grip does not bind, and that the bolt is secure.

(4) See that the right-hand lever spring is assembled to the lever and properly seated.

### k. Side Plate Trigger Group.

(1) See that the pin is flush with both faces of the housing.

(2) See that spring is seated securely in seat in both cam and housing bridge, and is not deformed.

(3) See that slide is assembled with ramped lug towards bolt hole in housing.

(4) See that ramped lugs on housing and bolt are seated evenly in the ramped cuts in the inner side of left-hand side plate when assembled to receiver, that nut is tight, and cotter pin prongs spread around nut.

(5) See that, when assembled to receiver, the right-angled face of the ramped lug on the slide faces *forward*.

### l. Packing the Barrel.

(1) See that front and rear packing is in good condition and evenly smoothed in place before assembling barrel to casing, and properly checked and adjusted after assembly.

(2) See that packing adjusting ring on rear end of barrel, gland and other parts in front end of water jacket are secured, and packing adjusted but not binding.

### m. Check of Assembled Gun.

(1) See that back plate is latched and locked, with lock on left side.

(2) See that retracting slide is assembled to the right side of the receiver.

(3) See that the side plate trigger (when assembled) is on the left side of the receiver.

(4) See that the lever of the cover latch shaft is on the left side of the cover.

(5) See that cartridge stops (and link stripper if assembled separately) are assembled on the right side of the trunnion block and the belt holding pawl on the left side.

## DISASSEMBLY, ASSEMBLY, AND ADJUSTMENT OF THE GUN

(6) See that the belt feed slide is positioned within the cover, with the belt feed pawl on the left and facing right, and the arm on the top of the pawl and facing right, when the cover is raised.

(7) See that the diamond-shaped cam lug on the rear end of the belt feed lever is to the left, so as to fit in the groove in the bolt marked "L" when the cover is closed.

(8) See that the bolt switch is in position with the narrow end to the rear.

(9) Operate gun and check action of sear and firing pin by pressing trigger or sear slide to release firing pin.

(10) Check water jacket and packing for leaks, and adjust packing if necessary, but avert binding.

(11) Adjust headspace and check as prescribed in paragraphs 45 and 46, after adjusting packing.

### 68. POSITION OF PARTS FOR RIGHT-HAND FEEDING

(fig. 66).

a. The M2 Gun, Water-cooled, when used with the mounts covered in this manual, must be assembled for *left-hand* feeding. Therefore, the assembly of the gun as described in this section is for feeding from the left-hand side. However, as guns may be received assembled for right-hand feeding, or it may be necessary to use the guns under different circumstances, so assembled, the positioning of the parts necessary for right-hand feeding are given below, according to groups in which change in position of parts is necessary.

b. The retracting slide may be assembled to either side of the gun irrespective of the feed, but it is usually assembled on the right side, and when the side plate trigger is used with the mounts covered herein, it must be assembled to the right side, as the side plate trigger must be on the left side to function with the trigger control mechanism on the mounts.

c. The cover latch shaft lever and the back plate latch lock must be on the opposite side, of their respective assemblies, to that on which the retracting slide is assembled, for clearance with the retracting slide.

d. The groups in which parts must be shifted or changed for right-hand feeding are the cover, bolt, and receiver groups. These changes are as follows:

#### (1) COVER GROUP.

(a) The belt feed slide is reversed in the guideway in the cover and reassembled so that the belt feed pawl arm, while still positioned on the belt feed pawl on the side towards the latch end of the cover, points to the *left*. The belt feed pawl is positioned in the *right* end of the slide and points *left*.

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

(b) The belt feed lever plunger and spring are seated in the plunger hole in the lever nearest the *slide end* of the lever. This positions the bolt cam lug end of the lever to the *right* when the cover is raised, so that it will seat in the groove in the bolt marked "R" when the cover is closed.

(2) BOLT GROUP. The bolt switch is positioned on the bolt switch stud in the bolt so that the *wide side* of the bolt switch is to the *rear*. This brings the belt feed lever cam groove in the switch in line with the groove in the bolt marked "R."

(3) RECEIVER GROUP.

(a) The right-hand rear cartridge stop assembly and the front cartridge stop are removed from the right side of the trunnion block, and a rear cartridge stop, link stripper, and front cartridge stop positioned on the *left* side of the trunnion block in a similar manner. (The right-hand rear cartridge stop assembly, which is composed of the rear stop, stripper, and cartridge alining pawl, is used only for left-hand feeding and assembled on the right side. It cannot be assembled on the left side.)

(b) The belt holding pawl is positioned on the right side of the trunnion block pointing to the left.

## 69. REPLACEMENT OF PARTS.

a. Broken, badly worn, or bent parts or assemblies should be replaced, when assembling, with new parts or assemblies taken from the spare parts provided as organizational spare parts and listed in SNL A-37. When more than one spare part or assembly is available they should be assembled by selection, as slight variations may occur with regard to the fit and functioning when assembled.

b. Spare parts or assemblies taken from organizational spare parts sets should be requisitioned and replaced so as to keep the sets of spare parts complete at all times. Spare parts sets should be inspected and oiled daily if possible to prevent rusting and insure completeness.

c. Repairs, other than minor, and such as can be accomplished by the replacement with spare parts provided, should be referred to qualified ordnance units.

d. When reassembling the gun, new cotter pins and lock wires should be used, if available, to obviate the possibility of such parts, which may be cracked or damaged, failing during firing.

## 70. DISMOUNTING AND MOUNTING GUN AND MOUNTS.

a. Dismounting and mounting the gun with respect to the mount, dismounting and mounting of the groups which comprise the mounts, as well as adjustments of the mounts, are covered in sections VII and VIII.

## Section VII

### A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

	Paragraph
General	71
Description	72
Functioning	73
Dismounting and mounting the gun and mount groups	74
Pedestal base	75
Adjustments	76
Care and cleaning	77

#### 71. GENERAL.

a. The two antiaircraft machine gun mounts covered in this section are practically identical with the exception of the sight groups. Therefore, as the M2 Mount (figs. 80 and 81) is the basic mount, it will be covered herein, and features uncommon to the M2A1 Mount (figs. 82 and 83) noted when they occur.

b. The M2A1 Mount is a modification of the M2 Mount to convert mounts not equipped with the automatic gun Antiaircraft Control Equipment Set M1. The conversion consisted of removal of the sight groups, together with their adjusting mechanism and support, from the cradle of the M2 Mount. The A.A. Sight M1 was then mounted to the water jacket of the gun as a substitute for the sights removed, and the mount designated as A.A. Machine Gun Mount, cal. .50, M2A1.

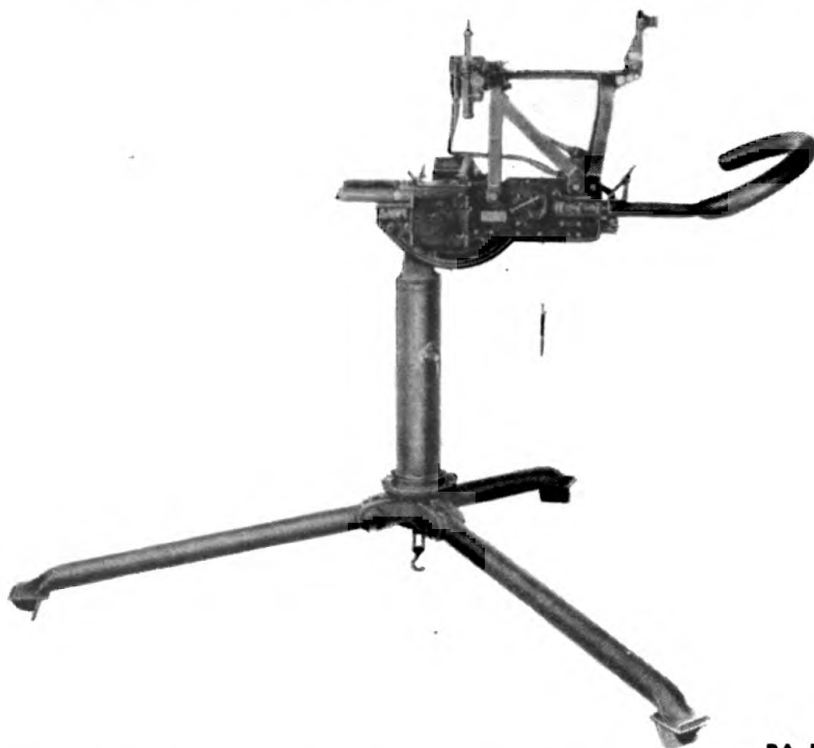
c. The cradle side plates of M2A1 Mounts, manufactured since the modification, are without the raised bosses necessary for the mounting of the sight support which was used on the M2 Mounts. For general data pertaining to the mounts, refer to paragraph 4.

#### 72. DESCRIPTION.

a. The A.A. Machine Gun Mount, cal. .50, M2 is normally assembled with three tripod legs as shown in figures 80 and 81. By removing the tripod legs and assembling a pedestal base (fig. 101), the mount may be installed on the deck of a vessel or other permanent position. When assembled with tripod legs, the mount is designated as A.A. Machine Gun Tripod Mount, cal. .50, M2 and when assembled with pedestal base it is designated as A.A. Machine Gun Pedestal Mount, cal. .50, M2. Except for the pedestal base which is assembled in place of the tripod legs, the pedestal mount is identical with the tripod mount described herein.



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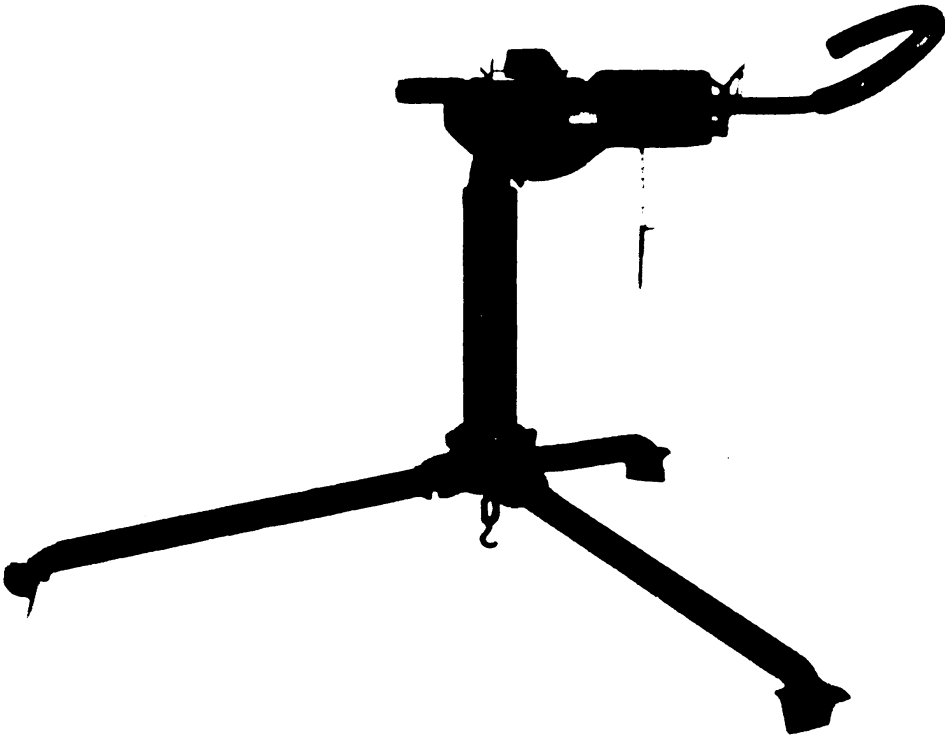
**Figure 80 — A.A. Machine Gun Mount, Cal. .50, M2 — Left Side View**



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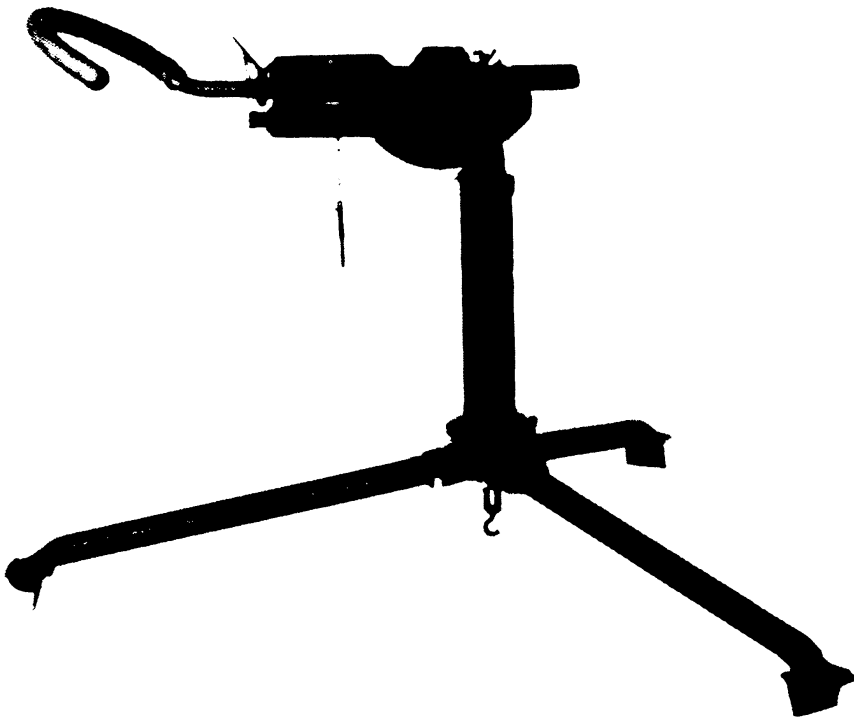
**Figure 81 — A.A. Machine Gun Mount, Cal. .50, M2 — Right Side View**

**A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1**



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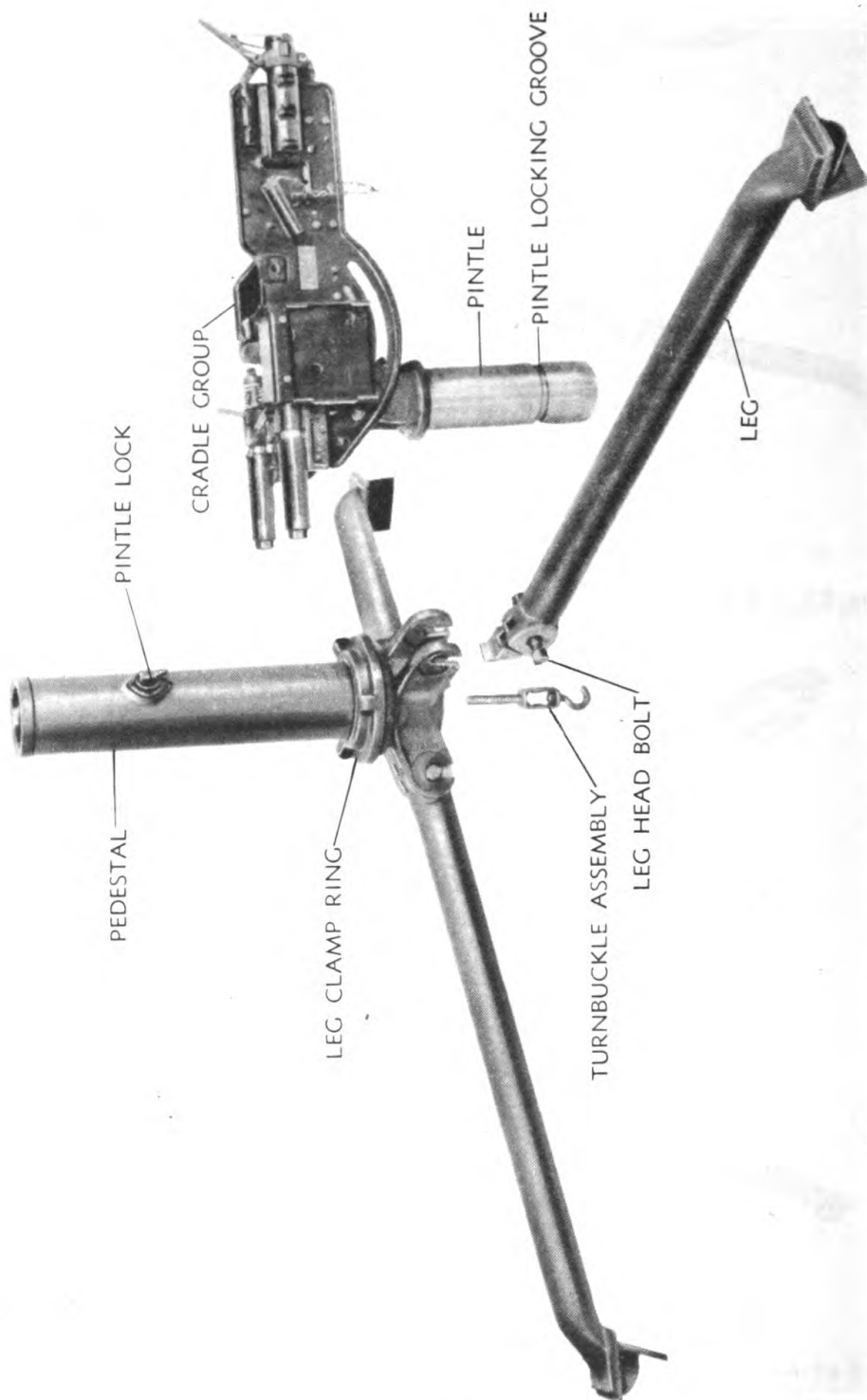
**Figure 82 — A.A. Machine Gun Mount, Cal. .50, M2A1 — Left Side View**



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**Figure 83 — A.A. Machine Gun Mount, Cal. .50, M2A1 — Right Side View**

BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



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Figure 84 — Groups Dismounted — A.A. Machine Gun Mount, Cal. .50, M2A1

**A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1**

b. The tripod mount consists in general of several groups of parts and assemblies (fig. 84). These groups are the pedestal, legs, cradle, back rest, and sight support to which is assembled the front and rear sights and the adjusting mechanism (M2 Mount only). The cradle pivots on the pintle, and the lower recoil and the upper buffer recoil mechanisms are assembled within the cradle, and the trigger control mechanism to the left side plate of the cradle.

**c. Pedestal Group (fig. 84).**

(1) The pedestal consists of a seamless steel tubing body lined with a bronze bushing (forced in place), which forms the seat for the cradle pintle when assembled. To the lower portion of the pedestal is assembled the pedestal base support ring, (inside) and the base ring (outside) which are welded in place. The support ring is drilled and tapped to receive a removable hook and turnbuckle provided to hold down and stabilize the tripod when set up on a hard base or in a truck or other vehicle. The pedestal is designed to be mounted on a pedestal base which is assembled in place of the tripod legs when the mount is to be permanently installed on a solid foundation or the deck of a vessel.

(2) The base ring, welded to the pedestal body, forms the connection of the pedestal with the tripod legs. A leg clamping ring assembly is threaded to fit the base ring and used to lock the tripod legs in position when assembled. The tapered ring of the clamping ring assembly engages a mating lug on the head of each leg, drawing the latter into place when the clamping ring is screwed down.

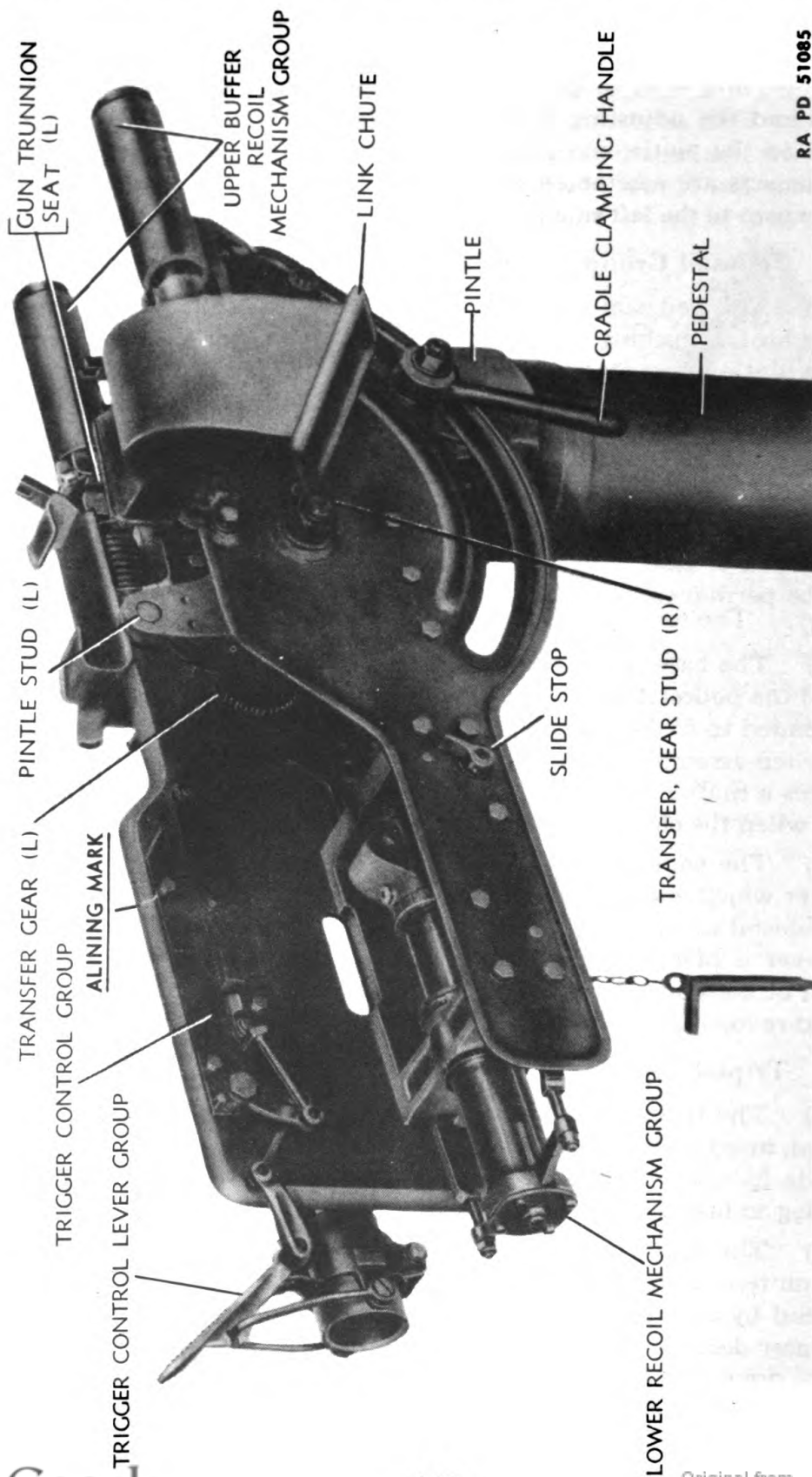
(3) The pedestal lock assembly is composed of a spring-actuated plunger which engages a mating groove in the pintle and retains it in the pedestal when assembled. A cam lever withdraws the plunger when the lever is placed in the horizontal position, thereby permitting removal of the pintle from the pedestal. The pintle, when assembled, is free to revolve in the pedestal through an arc of 360 degrees.

**d. Tripod Legs (fig. 84).**

(1) The tripod legs are seamless steel tubing; reinforced on the bottom, fitted on the upper end with a head and on the lower end with a spade foot, and welded in place. A bolt passes through the head of each leg to fasten it to the base ring.

(2) The bolt is machined to fit mating slots in the base ring which are countersunk to seat the nuts on the bolt. The bolt is locked to the leg head by a taper pin, and riveted washers prevent loss of the nuts. (On later design, nuts are  $\frac{1}{8}$  inch shorter and ends of bolt are peened over to prevent loss of nuts.) With the nuts engaged in the countersunk seats in the base ring, and the locking ring screwed down, the legs are locked in place.

BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 51085

Figure 85 — Cradle Mounted on Pedestal — Right Side View — A.A. Machine Gun Mount, Cal. .50, M2A1

**A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1****e. Cradle Group (figs. 85 and 86).**

(1) The cradle is the basic design for machine gun mounts and is composed of a right and left side plate, flanged to obtain maximum rigidity with minimum weight. The plates are assembled into a rigid unit and are kept in alinement by the construction of the cradle pintle, the box-like frame which houses the lower recoil mechanism, and by the shoulder spacer bolts. The ammunition box support and ammunition tray are assembled to the left cradle plate and the metallic link belt chute to the right plate.

(2) The cradle pivots vertically on the pintle studs (fig. 85) assembled to the pintle, its movement for elevation and depression being controlled by the length of the radial slots in the side plates. The plates are clamped in position (to the pintle) by means of the clamping handle on the end of the cradle clamping bolt which passes through the pintle and the slots in the side plates (fig. 85).

(3) The back rest is composed of a (covered) curved bar, adjustable, and clamped in position in the back rest bracket welded to the rear of the left side plate of the cradle (fig. 86).

(4) The sight support (figs. 90 and 91) is dovetailed into raised bosses on the side plates of the cradle and fastened by cap screws, and on it are mounted the front and rear sight groups as described in subparagraph f below.

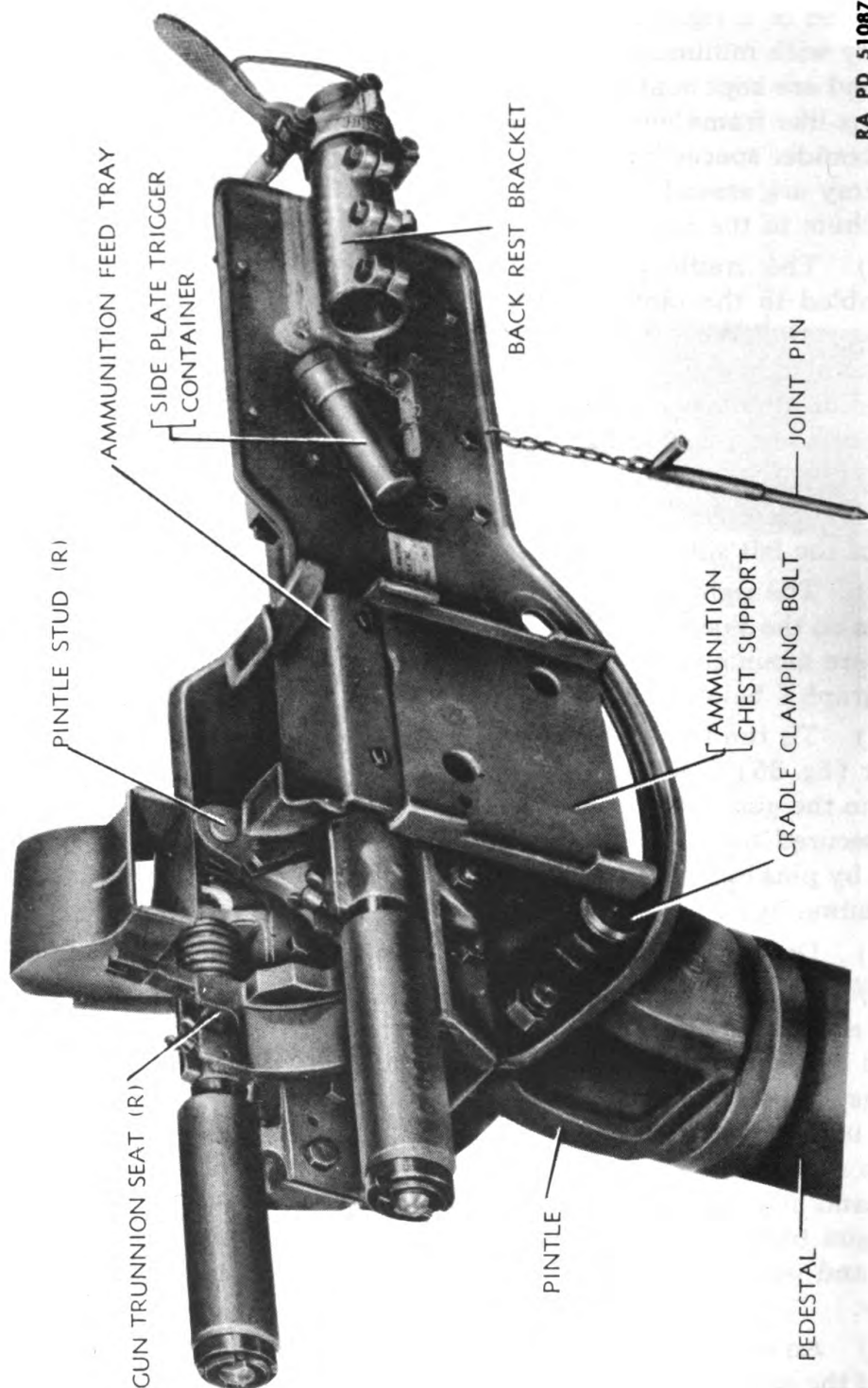
(5) To the left side plate is attached the side plate trigger container (fig. 86) in which the side plate trigger is kept when not assembled to the gun. This container is composed of a cylindrical body and cap secured by a chain to prevent loss. The cap is retained on the body by pins in the cap mating with cam slots in the body, and locked in position by turning the cap when mated.

**(6) UPPER BUFFER RECOIL MECHANISM GROUP (figs. 87 and 94).**

(a) The upper buffer recoil mechanism group is assembled in the front end of the cradle and is composed of a right and left group composed of like parts. Each group is composed of a bracket attached to the respective side plate of the cradle. In the bracket is housed a recoil shaft upon which are assembled a recoil and counterrecoil spring. Between these springs and sliding on the shaft is a slide. The right- and left-hand slides are bolted together to form a unit when assembled. The gun trunnions are seated in these slides and retained by hinged caps and wing nuts when mounted, as explained in subparagraph h below.

(b) An adjusting plug with locking nut threaded into the forward end of the spring housing on the bracket through which the recoil shaft passes, provides adjustment for the counterrecoil spring, and a nut on the rear end of the recoil shaft holds the shaft in position. A sleeve and spring guide assembled on the shaft keep the counterrecoil and recoil

BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



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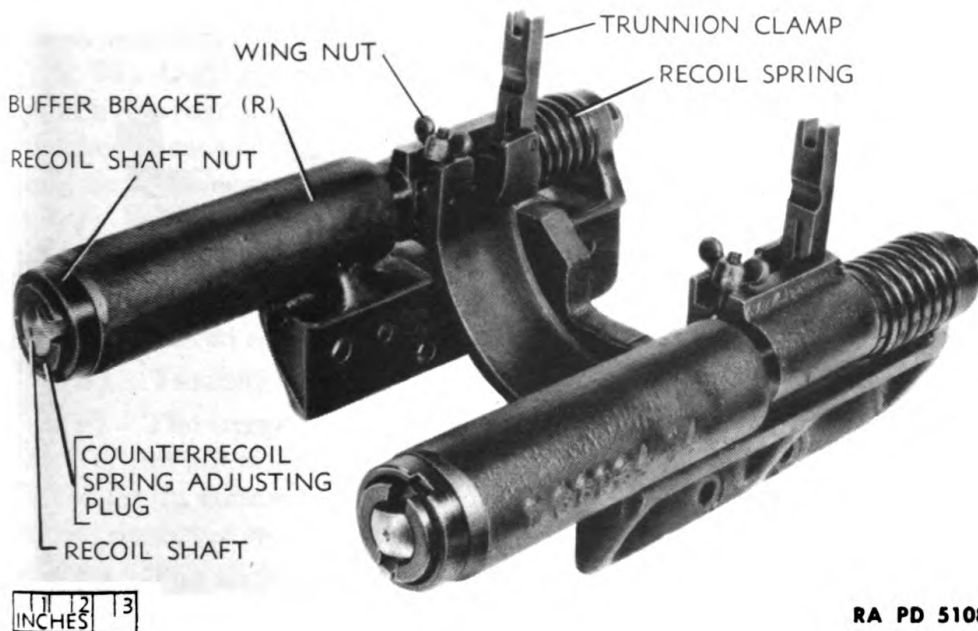
Figure 86 — Cradle Mounted on Pedestal — Left Side View — A.A. Machine Gun Mount, Cal. .50, M2A1

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springs from bearing directly on the slide which is positioned between them on the shaft.

### (7) LOWER RECOIL MECHANISM (figs. 88 and 93).

(a) The lower recoil mechanism is housed in a frame which is located between and secured to the cradle side plates. The assembly is composed of a cylindrical housing secured in the frame by nuts and machined to allow a slide fit for the slide described in substep (e) below. The housing houses the recoil spring, the compensating spring, and compensating spring guide rod. To the rear end of the guide rod is attached a T-shaped adjusting head to each end of which a sliding rack is attached.



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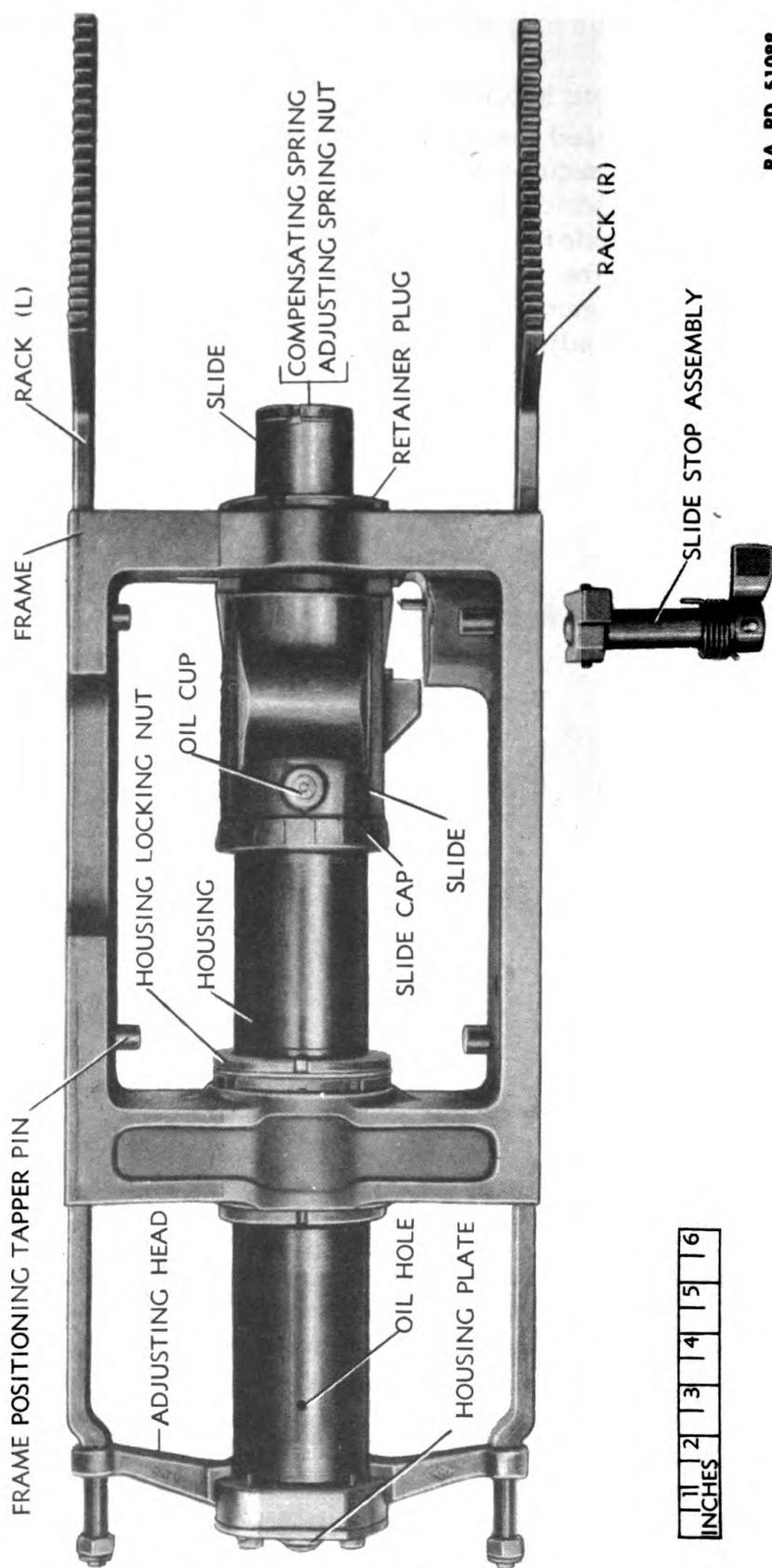
**Figure 87 — Upper Buffer Recoil Mechanism Group — Left Front View —  
A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

(b) The racks are in the form of long rods with a toothed radial segment at the front end. The racks slide in grooves in the frame and the toothed segments mesh with transfer gears mounted on studs pivoting in the side plates of the cradle. These gears, in turn, mate with toothed (gear) segments secured to the horns of the pintle.

(c) The compensating spring extends the entire length of the housing and bears at the front end upon a plug screwed into the front end of the slide through which the guide passes (fig. 95). The rear end of the spring bears upon the adjusting head, attached to the racks as explained above. Longitudinal movement of the head, produced by the longitudinal movement of the racks acted upon by the gears, in-



BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 51088

Figure 88 — Lower Recoil Mechanism Group With Slide Stop Removed —  
Top View — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1

## A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

creases or decreases the tension of the compensating spring, takes up the sag of the gun when elevated, and maintains the position of the side plate trigger on the gun with respect to the trigger control mechanism on the mount as explained later. The initial tension of the spring is adjusted by means of the retaining plug at the front end of the slide.

(d) The recoil spring is seated over the compensating spring and is compressed between the rear face of the slide and a cylindrical adjusting plug threaded to the inside of the housing through which the compensating spring and guide pass (fig. 95). Adjustment of this plug increases or reduces tension of the recoil spring to allow more or less absorption of recoil.

(e) The slide is roughly in the form of a stepped cylinder and bears and moves longitudinally on and within the housing when assembled. Assembly is permitted by means of an aperture in the housing (fig. 95). On the top of the slide is a raised lug drilled laterally, through which the rear joint pin passes when the gun is mounted. An oil wiping washer is assembled to the slide and held in position by a spring cap, and an oil cup in the slide furnishes a means of lubrication.

(f) In the right side of the frame is assembled the slide stop assembly. This stop is spring-operated and can be turned manually to engage a lug on the slide to hold it in the rearward position when the gun is being mounted as explained in paragraph 74.

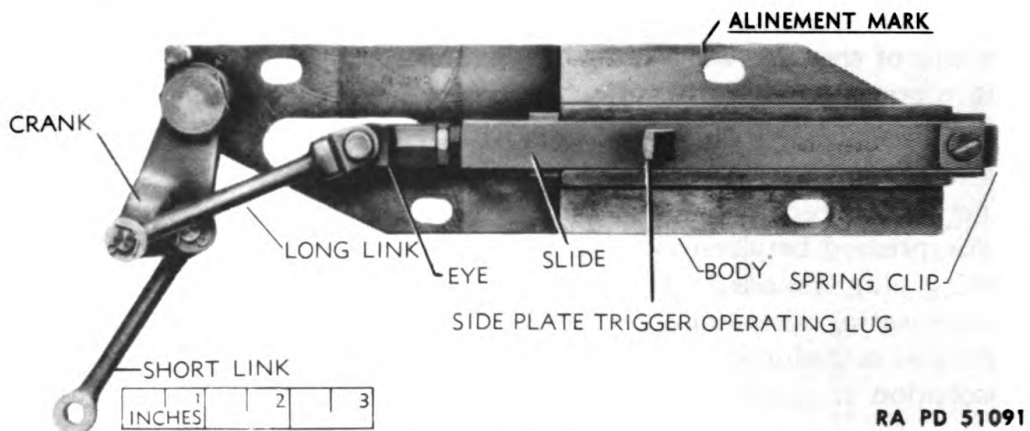
### (8) TRIGGER CONTROL MECHANISM GROUP (figs. 89 and 96).

(a) The trigger control mechanism group is assembled to the inner face of the left side plate, and is composed of a slide group and a hand lever group connected by means of a short and long link which are in turn connected by a crank secured to the body of the slide group.

(b) The slide group consists of a slide bar moving in guideways in a flat body bolted to the left side plate of the cradle. On the right side of the slide is a lug which contacts and operates the side plate trigger on the left side of the gun, when assembled. The slide is moved to the rear, to engage the side plate trigger, by the action of the hand lever acting through the above crank and two links attached to the rear end of a guide which passes through the rear end of the slide, and is positioned in the slide body by means of a collar on the guide bearing upon a shoulder in the body. A coiled buffer spring mounted on the guide bears on the rear face of the slide and the collar on the guide, furnishes the connection between guide and slide, and acts as a cushion between the slide and hand lever to absorb the side plate trigger firing load during automatic firing of the gun. A lighter coil spring, on the opposite end of the guide, bears upon the shoulder in the guide body and a clip fastened to the front end of the slide, and returns the slide to the forward position when the hand lever is released.

(c) The hand lever (fig. 96) by which the slide is retracted, is

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**Figure 89 — Trigger Control Slide Group — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

mounted on a clamp which is clamped to the back rest bracket welded to the left side plate of the cradle. This lever is pivoted on a pin, and given tension by a torsion spring mounted on the pivot pin. A U-shaped lock, assembled to the clamp, engages with a notch in the lever to hold it in position when the slide is in the forward disengaged position with respect to the side plate trigger on the gun. The alinement of the lever clamp on the back rest bracket and that of the trigger control body on the side plate of the cradle, determine the proper position of the lever and slide with respect to each other and the side plate trigger on the gun. This alinement must be correct in order that the functioning of the slide and side plate trigger (and the throw of the hand lever) shall be correct and properly timed as explained in paragraph 76 d.

**f. Sight Groups (figs. 90 and 91).**

(1) The front and rear sight groups, common to the M2 Mount only, are mounted on a raised sight support bolted to the cradle. The M2A1 Mount is furnished with a ring sight (fig. 92) mounted on the water jacket of the gun as explained in subparagraph g below, in a manner similar to that of the M3 Mount shown in figure 106.

**(2) REAR SIGHT GROUP (fig. 99).**

(a) The rear sight is mounted on a bracket which is secured in a clamp on the sight support. The bracket is provided with a hinged cap secured by a spring-actuated hinged pin attached to the cap and engaging a mating detent in the bracket. The cap is unlocked by unlocking and pulling down on the knob on the pin. A pin is seated in the bottom of the circular sight seat in the bracket for locating the body of the sight with respect to the bracket.

(b) In the body of the sight is assembled a rotatable disk provided with  $\frac{5}{16}$ -,  $\frac{1}{4}$ -,  $\frac{3}{16}$ -, and  $\frac{1}{8}$ -inch peep holes, which can be brought in line with the front sight by rotating the disk. Each adjustment is se-

A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

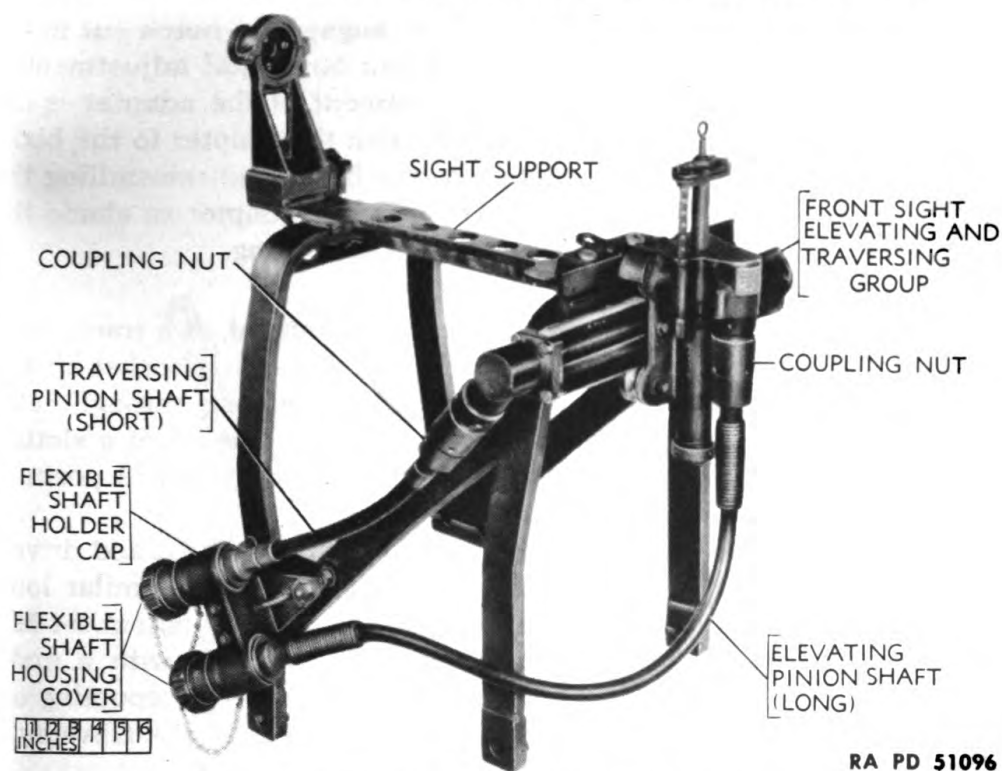


Figure 90 — Front and Rear Sight Groups Mounted on Sight Support — Right Side View — A.A. Machine Gun Mount, Cal. .50, M2

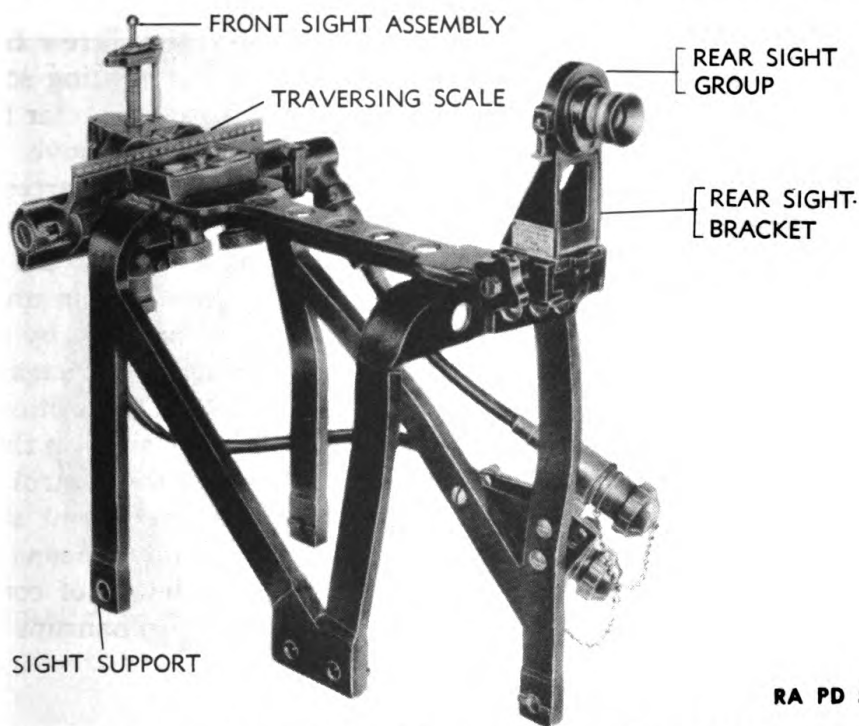


Figure 91 — Front and Rear Sight Groups Mounted on Sight Support — Left Side View — A.A. Machine Gun Mount, Cal. .50, M2

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

cured in position by a spring-actuated pin engaging a notch cut in the periphery of the disk. A slight vertical and horizontal adjustment is provided by means of an adapter. Adjustment of the adapter is obtained by removing three screws which fasten the adapter to the body, repositioning the adapter in relation to the body, and reinstalling the screws. A rubber eyeshield is assembled to the adapter to shade the peep holes and protect the eye when the gun is firing.

(3) **FRONT SIGHT GROUP** (fig. 100).

(a) The front sight group is composed, in general, of a track body mounted on the sight support by means of a dovetail socket in the support, and two bolts seated in the support and passing through holes in the track body. The body is locked in place by means of a slotted plate engaging in slots in the top of the bolts and locked in position by a screw.

(b) A traversing screw is assembled in the track body, and driven by means of a short flexible shaft cable connected by a similar long cable with the Automatic Gun Antiaircraft Control Equipment set M1 described in section X. The flexible shaft is equipped with a male coupling on the drive shaft which engages with a female coupling on the track body, which acts through a pinion to rotate the traversing screw in the body.

(c) The elevating screw is assembled in a body which moves on steel rollers in traverse on the track body, referred to above, and is engaged with the traversing screw. As the traversing screw is turned by means of the control equipment set, the elevating screw body is moved in traverse to right or left as desired. The elevating screw is raised or lowered by a flexible shaft cable in a manner similar to that employed for turning the traversing screw as explained above.

(d) The open front sight is composed of a ring quartered by crossed wires, and integral with an elongated neck and base. The base is in the form of a circle with flat sides, and is assembled to the top of the elevating screw by means of flanges on the base and an undercut slot in the top of the elevating screw. It is locked in place by sliding the base into the slot and then turning it 90 degrees to engage the undercuts. A spring-functioned retaining plug locks it in position.

(e) Elevation and depression of the open front sight is thus obtained by rotation of the elevating screw by means of the control equipment set flexible drive shaft. Traversing of the open front sight is obtained by rotation of the traversing screw by similar means which moves the elevating screw body right or left. For details of construction, refer to the exploded views of the above sight mechanisms shown in SNL A-37.

g. **A.A. Sight M1** (fig. 92).

(1) The M2A1 Mount is assembled without the front and rear sight groups and sight support described above. In place of these sights

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Figure 92 — A.A. Sight, M1 — Right Side View — A.A. Machine Gun Mount, Cal. .50, M2A1

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the A.A. Sight M1, is assembled to the water jacket of the gun when assembled to the mount.

(2) This sight is composed of a large and small concentric ring welded to a flat bar. The bar is bolted to two V-shaped upright bars welded to a half cylindrical body which fits on the top of the front end of the water jacket of the gun when assembled. An oblong aperture in the body fits over the front (gun) sight on the water jacket and positions the body.

(3) Two metal hinged straps equipped with toggle bolts and wing nuts, which engage in retaining slots in the body, clamp the sight in position on the water jacket.

(4) The large ring of the sight is divided into quarters by two cross bars which support a small ring at their intersection. The small ring is entirely open, as is the small ring on the opposite end of the ring bar. When assembled, the large ring is at the front. The large ring is for quick location of the target, which is then alined through the two small rings.

**h. Gun Mounting.** The machine gun is mounted in the cradle by the gun trunnions on the rear end cap of the water jacket seating in the right and left trunnion slides in the upper buffer recoil mechanism group and locked in position by hinged caps and wing nuts. The rear end of the gun is secured in the cradle by the joint pin passing through the mounting lug on the bottom plate of the gun and the lug on the slide in the lower recoil mechanism.

**73. FUNCTIONING.**

**a. Purpose of Mount.**

(1) The purpose of the mount is to provide a solid foundation for the gun so that the muzzle can be swung up or down, and right or left to cover a moving target. The horizontal movement is obtained through the rotation of the pintle in the pedestal of the mount and the vertical movement by the pivoting of the cradle on the cradle pintle trunnion studs located in the horns of the pintle.

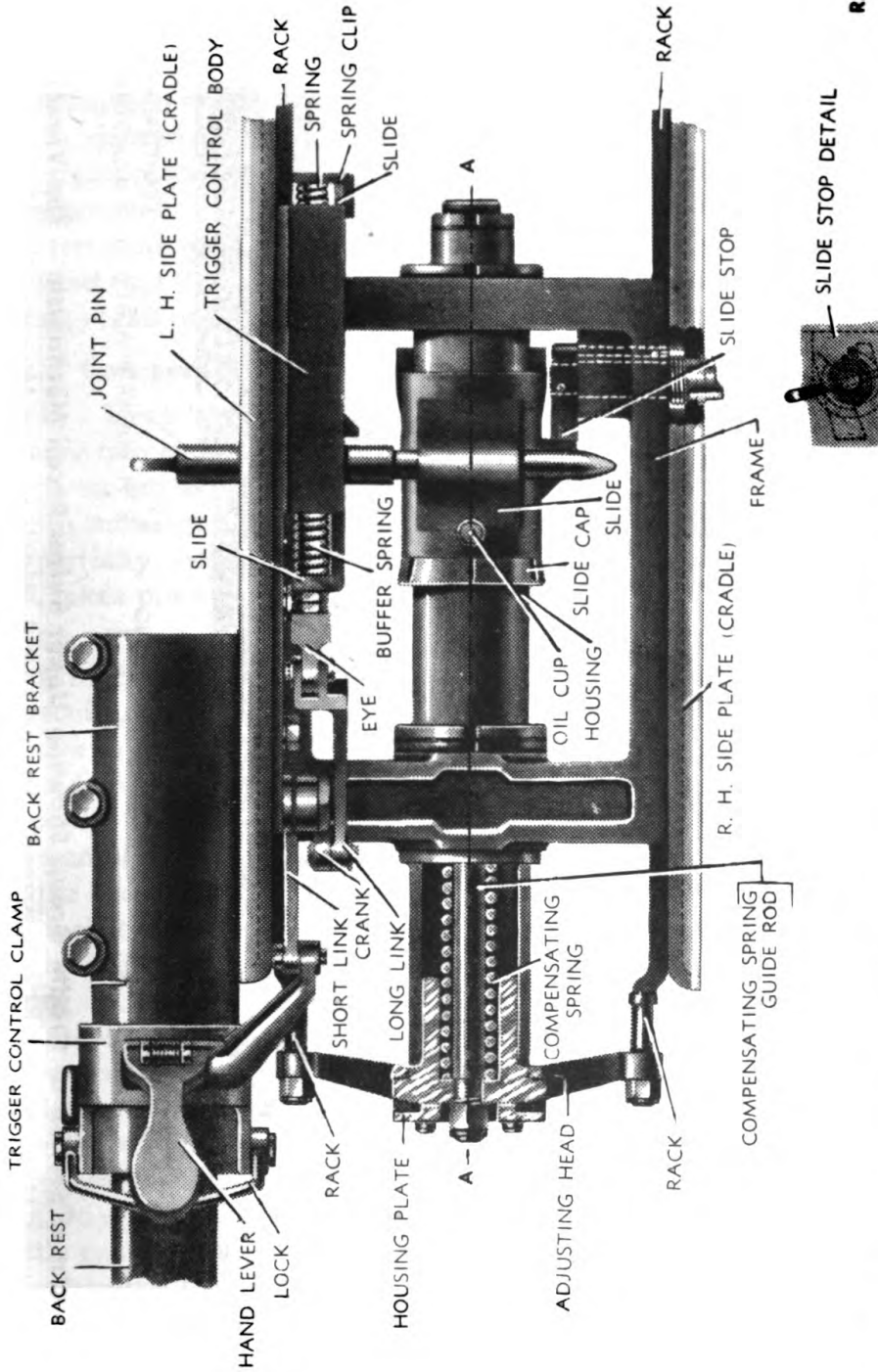
(2) The cradle, and hence the gun, can be locked at any elevation between minus 15 degrees and plus 68.75 degrees from the horizontal by clamping the cradle to the pintle by means of the cradle clamping bolt, extending through the pintle and radial slots in the side plates of the cradle, and clamping handle as already explained in subparagraph 72 e. The pintle is free to rotate through an arc of 360 degrees.

**h. Recoil and Counterrecoil (figs. 93, 94, 95, and 96).**

(1) The gun is fastened to the mount at the front by the trunnion clamps in the slide members of the upper buffer recoil mechanism, and at the rear by means of the joint pin which passes through a hole in a



A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

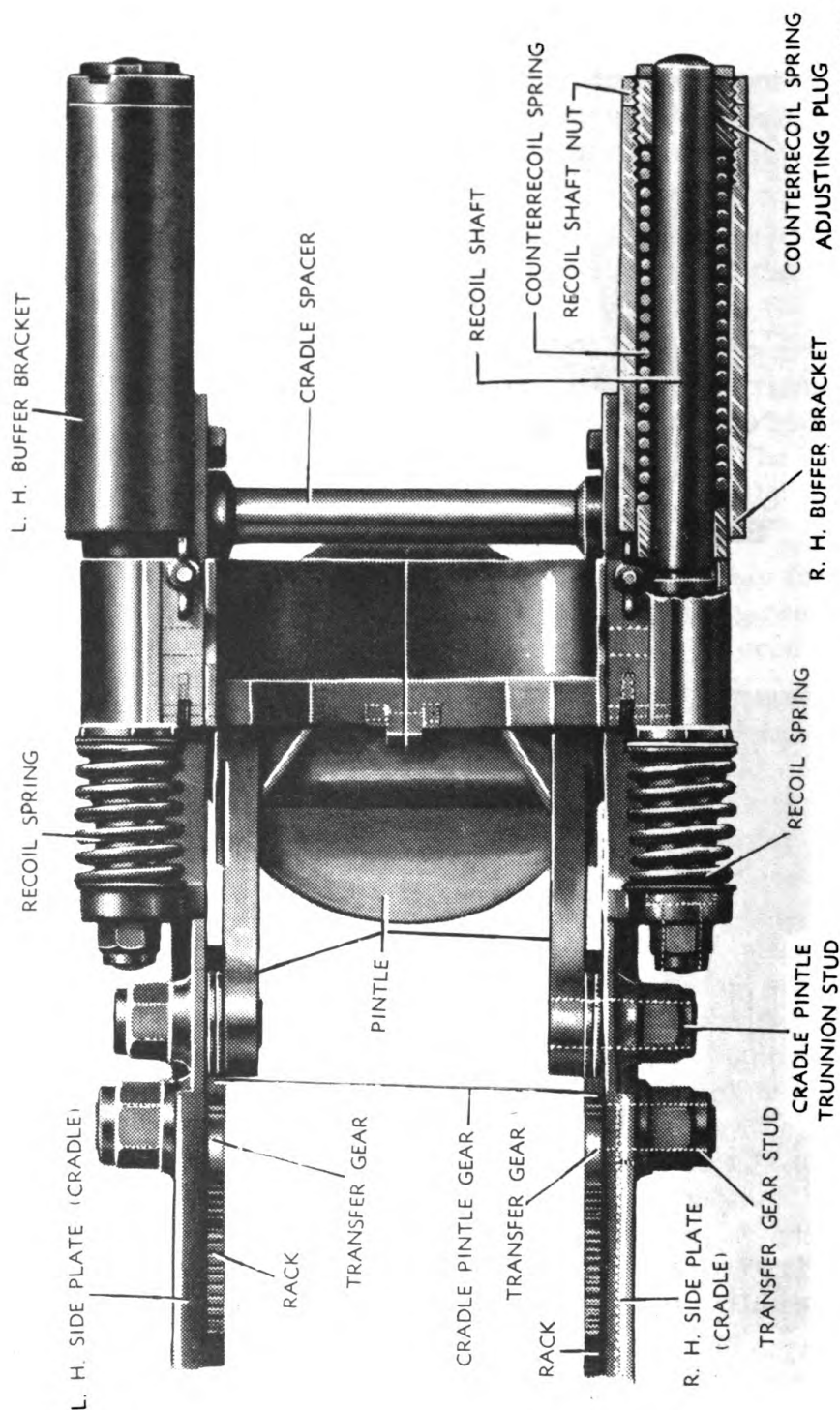


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Figure 93 — Rear Section of Cradle Group Showing Lower Recoil and Trigger Control Mechanisms — Top View — Cutaway Section Showing Compensating Spring — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1



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Figure 94 — Front Section of Cradle Group Showing Upper Buffer Recoil Mechanism — Top View — Cutaway Section Showing Upper Buffer Counterrecoil Spring — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1

**A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1**

lug on the bottom plate of the gun and a lug on the slide assembled in the lower recoil mechanism of the mount as already explained. The recoil of the gun is taken by the recoil spring assisted by the compensating spring in the lower recoil mechanism, and the left and right upper buffer recoil springs.

(2) The gun is returned to battery, with respect to the mount, by the expansion of the compressed recoil spring in the lower recoil mechanism assisted by the compensating spring and the compressed left and right recoil springs in the upper buffer recoil mechanism. The counterrecoil of the gun is absorbed by the left and right upper buffer counterrecoil springs. The recoil and counterrecoil springs must be so adjusted that there will be no metal-to-metal contact in the slides either during recoil or counterrecoil as explained in paragraph 76.

**c. Compensating Movement.**

(1) Recoil and counterrecoil are thus taken care of by the recoil, compensating, and counterrecoil springs when the gun is level or nearly so, but as the gun is elevated, it will sag against the recoil springs due to its weight and hence expend some of their resistance to recoil by partially compressing them, before the recoil, due to firing of the gun, takes place.

(2) The function of the compensating spring (fig. 93) in the lower recoil mechanism is to take up this sag as it occurs (as well as variations in recoil), so that the recoil springs will have their full compression reserve to withstand the recoil of the gun and return it to battery, and the side plate trigger on the gun will be kept in proper position with respect to the slide in the trigger control mechanism of the mount. This is accomplished by relieving the pressure, due to the weight of the gun, on the slide and hence the recoil spring on which the slide bears, by increasing the tension of the compensating spring which bears on the forward end of the slide. This increase of tension of the compensating spring is attained by the forward movement of the adjusting head which bears on the rear end of the compensating spring. This forward movement of the adjusting head is accomplished by forward movement of the racks (fig. 96) which are attached to it. The racks are moved forward by rotation of the transfer gears meshed with the toothed segments in the forward ends of the racks and pivoted to the cradle (fig. 96). The transfer gears are rotated on their pivot studs by the pintle gears affixed to the horns of the pintle which act as a fixed lever to rotate the transfer gears as the cradle pivots up and down on the pintle studs, as the gun is elevated or depressed.

(3) Normal tension of the recoil spring is obtained by adjustment of the recoil spring adjusting plug threaded inside the lower recoil mechanism housing (fig. 95). Normal tension of the compensating spring is obtained by adjustment of the compensating spring-adjusting

BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

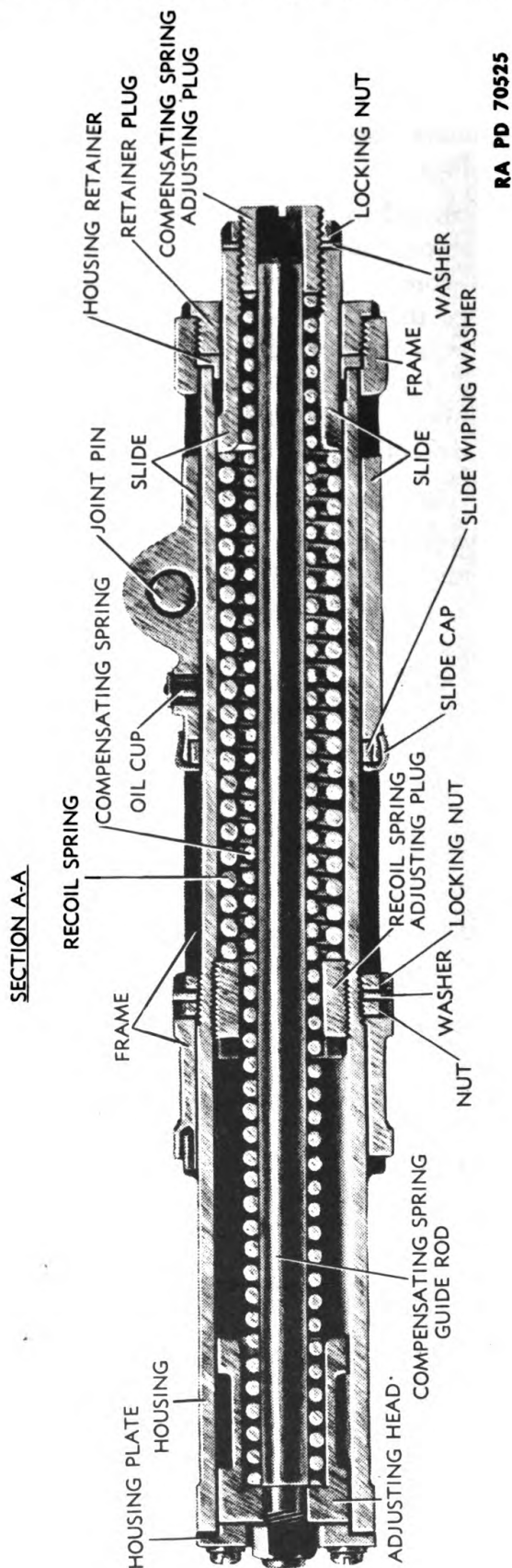
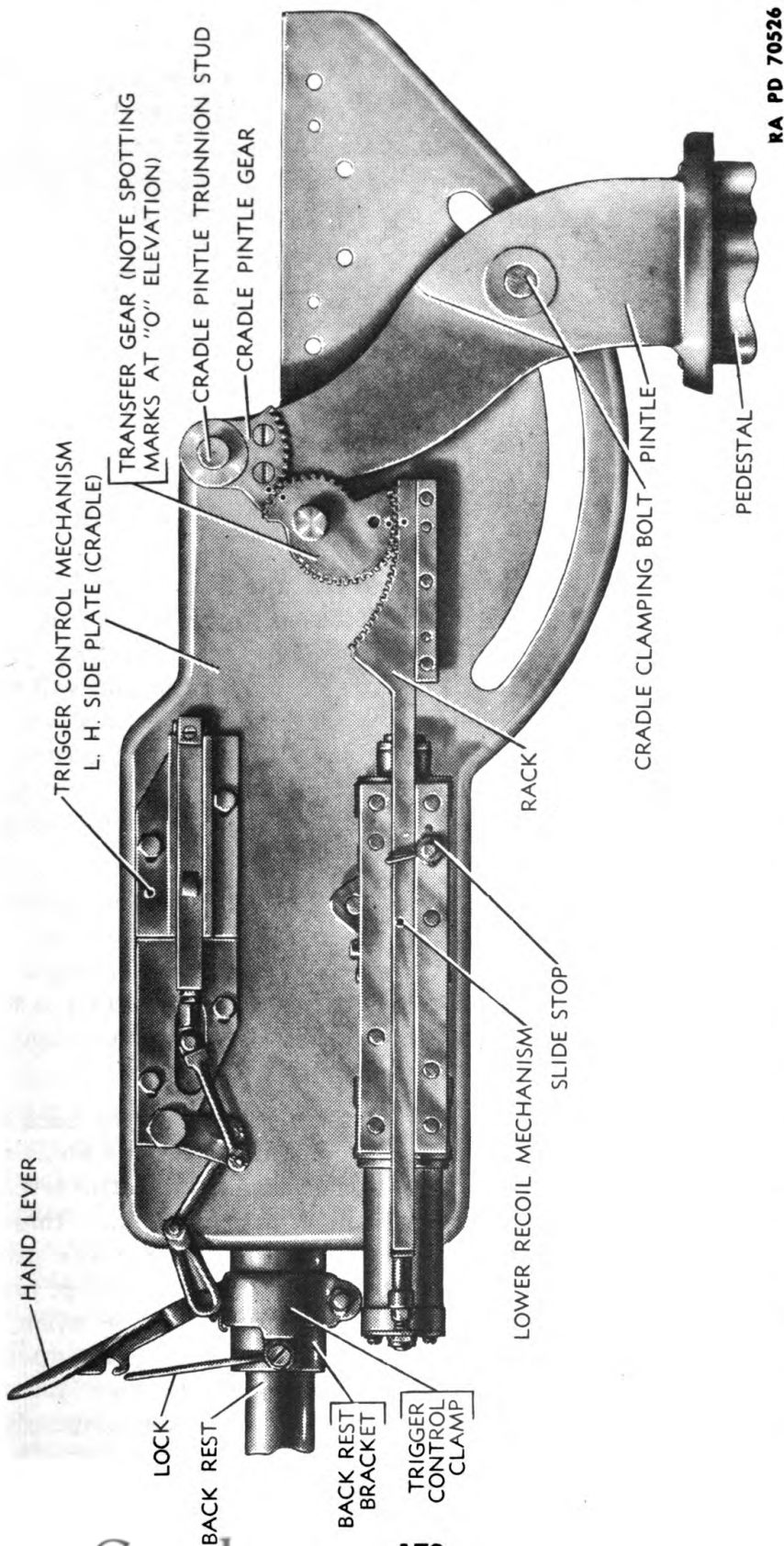


Figure 95 — Lower Recoil Mechanism — Sectional View — A.A. Machine Gun Mounts, Cal. 50, M2 and M2A1

A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1



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**Figure 96 — Cradle with Right-Hand Side Plate Removed, Showing Position of Lower Recoil Mechanism and Trigger Control Mechanism — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

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plug (fig. 95) threaded into the forward end of the slide as explained in paragraph 76.

(4) The transfer gears are assembled so that the larger toothed section meshes with the racks and the smaller section with the pintle gears. A small hole in the transfer gears, which should lie in a perpendicular line between the gear pivot stud and the rack, and spotting marks on racks, gears, and pinion gears determine their proper position when assembled, with the cradle at "O" elevation (fig. 96).

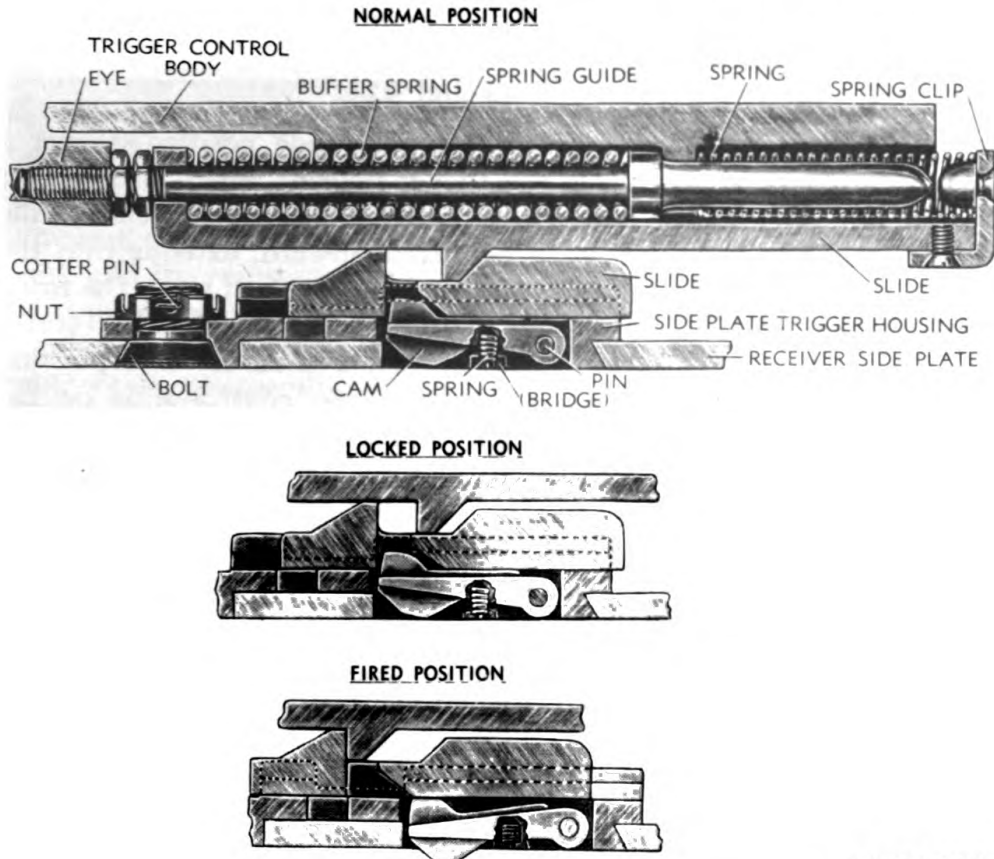
**d. Trigger Control Mechanism (figs. 89 and 97).**

(1) The trigger control mechanism on the mount is the means by which the gun is fired either singly or automatically. A lug on the slide of the control mechanism aligns with a lug on the slide of the side plate trigger on the gun when assembled to the mount, but does not contact it. Initial firing of the gun is accomplished by retracting the slide on the mount by means of the hand lever assembled to the mount, so that it contacts and retracts the side plate trigger slide on the gun which in turn contacts the sear slide to fire the gun as explained in subparagraph e below. If this lever is released immediately, the slide on the mount will be moved forward by the trigger control spring which it has compressed during its contraction, and the gun will stop firing. If, however, the lever is held down, and the slide thus held retracted, the gun will continue to fire automatically within the capacity of the ammunition belt, as the lug on the slide of the side plate trigger will strike the lug on the slide of the trigger control each time the gun counterrecoils, and thus fire the gun.

(2) As the gun counterrecoils with some force, considerable strain is borne by the trigger control slide and side plate trigger as they strike. This strain is cushioned and relieved by the buffer spring in the trigger control mechanism which bears upon the rear end of the slide and the collar on the spring guide which in turn bears upon a shoulder in the slide housing.

(3) The hand lever is mounted on a clamp affixed to the back rest bracket on the mount and connected to the slide through a short and long link and a crank. The short link connects an arm on the lever to the crank, while the long link connects the crank to the slide through the medium of the buffer spring guide and spring. The crank pivots on the trigger control body, and the lever pivots on the clamp; hence by offset leverage the slide is drawn back in a straight line when the hand lever is pressed down and rotated. The hand lever is returned to its normal position by a torsion spring mounted on the pivot pin and bearing on lever and clamp. The return is assisted by the action of the trigger control mechanism spring in the body acting on the lever through the slide, buffer spring, links, and crank.

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**Figure 97 — Positions of Trigger Control Mechanism Slide with Respect to Side Plate Trigger Slide — Sectional View — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

(4) The trigger control slide must be positioned properly with respect to the side plate trigger, and the hand lever with respect to the slide, in order to function properly. This is accomplished by an alinement mark on the trigger control housing and side plate of the cradle upon which it is mounted, and an alinement mark on the back rest bracket on which the lever clamp is mounted (figs. 85 and 102). The distance between lever and slide must be constant, and so, if the body is moved for adjustment the clamp must be moved correspondingly to maintain the proper relationship. Proper positioning of these parts is explained in paragraph 76.

(5) However, if the relative position of the trigger control slide and the side plate trigger on the gun is correct when the cradle and gun are level, there would be a tendency for them to separate as the gun sagged against the recoil springs when elevated, due to its weight. This tendency is taken care of by the action of the adjusting head upon the compensating spring in the lower recoil mechanism, which keeps

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

the gun in the proper position with relation to the mount when elevated or depressed, as explained above.

**e. Side Plate Trigger (figs. 78 and 97).**

(1) The side plate trigger consists of a slide positioned over a hinged, spring-actuated cam in the trigger housing which is bolted to the left side plate of the gun. The cam extends through a slot in the side plate of the gun, and when depressed inward, extends into the receiver far enough to contact the sear slide in the bolt when the firing pin is cocked. The cam, when not depressed, seats in an aperture in the slide, with which it mates when the slide is in the forward position and thus not contacting the lug on the trigger control slide on the mount, which moves it backward and forward either when moved by the hand lever, or as the gun recoils and counterrecoils in the mount (fig. 97). With the hand lever of the trigger control mechanism held down in the firing position, and the slide in the trigger control mechanism thus held in a retracted position, the slide lug acts as a fixed stop against which the lug on the side plate trigger strikes, and is thus operated.

(2) Thus, as the gun recoils when firing automatically, the slide in the side plate trigger is pushed forward with respect to the gun and the cam withdraws into the relief aperture in the slide due to its spring action. As the gun moves forward in counterrecoil, the slide is moved backward with respect to the gun, and forces the cam into the receiver to contact and move the sear slide to the right, as the bolt reaches the firing position, to cam the sear from engagement with the firing pin extension and fire the gun. This action is so timed by the position of the trigger control slide with respect to the side plate trigger, and the side plate trigger cam with respect to the sear slide in the bolt when approaching battery position in the gun, that the gun fires just before the recoiling parts are fully in battery in the gun, and before the gun is fully in battery in the mount.

(3) Slight variations in position of the side plate trigger with respect to the trigger control slide is taken care of by the clearance in the notch in the side plate trigger slide in which the trigger control slide lug acts. The blow of the side plate trigger contacting the trigger control slide, when the gun is firing, is cushioned by the buffer spring in the trigger control mechanism on the mount as explained.

(4) The counterrecoil of the gun is cushioned by the upper buffer counterrecoil springs, but as the gun, when firing automatically, fires before it has completely returned to battery, the forward movement is stopped and the recoil movement started before the gun has reached the limit of the counterrecoil movement. In the case of a single shot or the last shot of a burst, the entire force of counterrecoil is taken by the counterrecoil springs. These springs should be so adjusted that



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there is no metal-to-metal contact during automatic firing of the gun as explained in paragraph 76.

**74. DISMOUNTING AND MOUNTING THE GUN AND MOUNT GROUPS (fig. 98).**

a. Dismounting and mounting the gun and groups which comprise the mount, as covered herein, include the removal of the gun from the mount, and the reinstallation therein as well as the removal and reinstallation of the main groups of parts and assemblies which comprise the mount assembly for convenience in cleaning or transportation. Should other disassembly and assembly be required, it should be referred to a qualified ordnance unit in order that experienced personnel with proper tools may be furnished or directions transmitted. In dismounting, it is assumed that the gun and mount are set up ready for action.

**b. Dismounting.**

**(1) PRELIMINARY.**

(a) Lock the cradle firmly at "O" elevation, and fully unload the gun.

(b) Disconnect the flexible cables leading from the control equipment set, and screw on the shaft housing covers.

(c) Remove the water hoses from the water jacket of the gun by unscrewing the connection nuts, and screw on the union caps. (If the gun is to be disassembled or transported, the water jacket should be drained by opening the drain valve with one or both of the union caps removed. Observe care that dirt does not get into the connection nuts of the hoses while disassembled.)

(d) Remove the ammunition chest and ammunition tray from the cradle.

(e) Remove the back rest by loosening the clamping bolts and withdrawing to the rear. Observe care not to disturb the trigger control lever clamp on the back rest bracket.

(f) Unscrew the turnbuckle (if in use) and disconnect the hook.

**(2) SIGHTS (M2 MOUNT) (figs. 99 and 100).**

(a) Rotate the front sight 90 degrees to clear the undercut, and remove the front sight.

(b) Unlatch the rear sight bracket cap by pulling the latch knob down and outward, and remove the rear sight body group from the bracket. Then relatch the cap.

(c) Loosen the rear sight bracket clamp on the sight support by loosening the locking nut and then turning the knob counterclockwise, and slide the bracket to the rear out of the clamp.

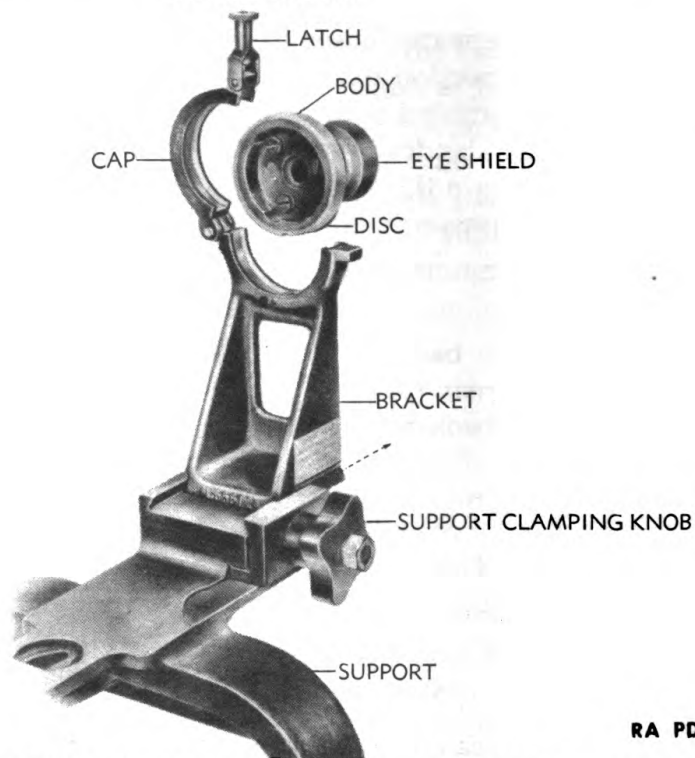


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**Figure 98 – Gun, Water Chest and Ammunition Chest Assembled to M2 Mount**



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**Figure 99 – Rear Sight Aperture Group Dismounted from Bracket and Bracket Partly Withdrawn from Sight Support – A.A. Machine Gun Mount, Cal. .50, M2**

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(d) Disconnect the flexible cables from the elevating and traversing screws of the front sight mechanism by unscrewing the couplings.

(e) Unscrew the two locking knobs on the under side of the sight support to loosen the locking bolts by turning counterclockwise. Then loosen the front sight locking plate screw and pull the plate to the rear to disengage it from the undercuts in the bolt heads.

(f) Pull the front sight mechanism upward out of the dovetailed socket in the sight support.

(g) Place the sights and component mechanisms in the sight chest.

(h) It is easier to dismount and mount the gun with the sight support removed. To remove, unscrew the cap screws and slide the support forward out of the grooved lugs on the cradle.

**NOTE:** The gun can be dismounted with the sights and back rest assembled, but for convenience they may be removed.

(3) **SIGHTS (M2A1 MOUNT)** (fig. 92). Disengage the hinged clamping straps by unscrewing the wing nuts and swinging the toggle bolts out of engagement with the straps. Then lift the sight from the water jacket of the gun, and refasten the straps.

### (4) GUN.

(a) Force the gun slightly to rear, against the pressure of the recoil springs, and push down the recoil mechanism slide stop, located on the right side of the cradle opposite the slide, to engage the stop with the lug on the slide. This will prevent the recoil slide from moving too far forward when the gun is removed. If this is not done, difficulty will be encountered in properly alining the slide and the mounting lug on the bottom plate of the gun to insert the rear gun joint pin when mounting the gun. This stop will return automatically to the disengaged position after the first round is fired.

(b) Pull out the joint pin from the left side of the cradle to release the gun from the lower recoil mechanism slide.

(c) Unscrew the wing nuts of the trunnion slide clamps, part way, and raise the clamps.

(d) Lift the gun out of the cradle, observing care that the side plate trigger does not strike the cradle, or damage to the trigger may result.

### (5) CRADLE AND PINTLE.

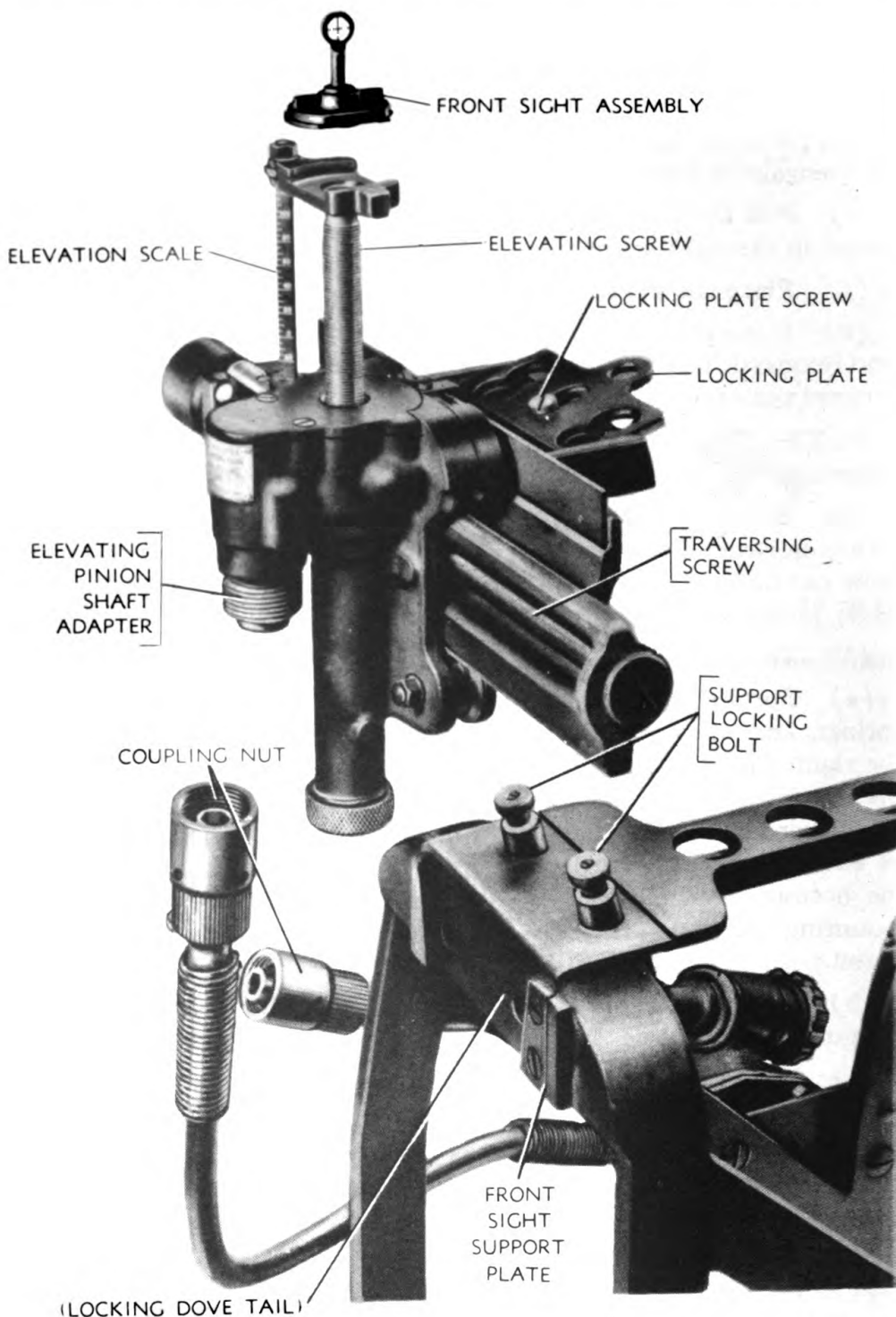
(a) Disengage the pintle lock on the pedestal from the pintle by raising the lever to a horizontal position.

(b) Lift the cradle with pintle attached from the pedestal.

### (6) TRIPOD LEGS.

(a) Unscrew the leg clamping ring by turning counterclockwise.

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**Figure 100 — Front Sight Elevating and Traversing Mechanism Dismounted from Sight Support Showing Method of Attachment — A.A. Machine Gun Mount, Cal. .50, M2**

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(b) Back off and loosen the nuts on the bolts, which fasten the legs to the base ring, by screwing the nuts out against the stops.

(c) Remove the tripod legs by sliding them downward out of the slots in the base ring. In removing the legs, tilt the pedestal so that the leg being removed is clear of the ground.

**c. Mounting.****(1) TRIPOD LEGS.**

(a) Slide the leg heads into the slots in the base ring so that the leg head bolts are seated in their slots, and tighten the nuts on the leg head bolts. (The first two legs may be mounted with the pedestal lying horizontal. The pedestal may then be raised and held upright while mounting the third leg, or righted after legs are mounted.)

(b) Screw down and tighten the leg clamping ring on the base ring.

**CAUTION:** Observe care that dirt does not enter the pintle bearing in the pedestal while assembling the legs.

**(2) CRADLE AND PINTLE.**

(a) With the pedestal upright on the tripod legs and the group firmly grounded, raise the pintle lock lever on the pedestal to the horizontal position, and slide the pintle, with cradle attached, into the pedestal. Be sure pintle and bearing in pedestal are clean and oiled as directed for the prevailing temperature. (If the mount is hooked to a solid base or vehicle, engage hook with eyebolt and clamp mount in position before mounting pintle and cradle.)

(b) Lock the pintle in the pedestal by pushing the lock lever downward until parallel with the pedestal. Be sure pintle is fully seated; do not force the lock. Revolve pintle to insure proper locking and freedom of movement.

**(3) GUN.**

(a) With the cradle clamped firmly in the horizontal position, raise the trunnion slide clamps.

(b) If the lower recoil mechanism slide is not held back in rearward position by the slide stop (subparagraph h (4) (a) above), force it to the rear, and retain it with stop before mounting the gun. This may be accomplished by placing the foot against the front end of the slide and pushing it to the rear until the stop can be engaged with the slide.

(c) Lift the gun horizontally, seat the gun trunnions in the trunnion slides of the upper buffer recoil mechanism, and clamp in position by fastening the slide caps with the wing nuts. Then, lower the rear end of the gun over the drilled lug on the lower recoil mechanism slide until the holes in the gun mounting lug on the bottom plate of the gun seats over the slide lug and the holes aline. Observe care not to strike the side plate trigger on the gun against the mount while mounting, as the trigger may be damaged.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

(d) Insert the joint pin through left-hand cradle plate and the alined holes of gun and slide lugs, and push home. Be sure the locking spring is assembled in the pin.

**NOTE:** If difficulty is experienced in lining up the holes in gun and slide lugs, and the gun is too far forward, it can be pushed to the rear against the force of the recoil springs. If, on the other hand, it must be moved forward for alinement, the gun should be held against the force of the recoil springs, the slide stop released, and the gun eased forward slowly until the pinholes are in alinement.

**(4) SIGHTS (M2 MOUNT) (figs. 99 and 100).**

(a) If the sight support has been removed, slide it into the grooved lugs on the rear end of the cradle side plates from the front, and fasten tightly with the sight support cap screws.

(b) Slide the rear sight bracket into the dovetail of the rear sight clamp on the sight support from the rear. Tighten the clamp by turning the knob clockwise, and lock in place with the locking nut.

(c) Seat the rear sight body group in the groove in the rear sight bracket, so that the cut in the periphery of the body engages the cross pin in the bottom of the groove in the bracket, and the eyepiece faces to the rear. Then, latch the bracket cap by pulling the knob down, seating in detent in bracket, and then screwing up to lock in place.

(d) Slide the front sight mechanism into the dovetail in the forward face of the sight support so that the clamping bolts extend through the holes in the rear flange on the mechanism. Slide the locking plate forward, so that the narrow portion of the slots in the plate engage the undercut in the heads of the clamping bolts. Then, tighten the locking plate retaining screw, and clamp the sight mechanism to the sight support by tightening the locking knobs. (A slight adjustment of the dovetailed slot in the sight support can be made, if necessary, by shifting the front sight support plate screwed in the dovetailed slot in the sight support.)

(e) Place the open front sight with the flats of the base mating with the slot in the head of the elevating screw, and turn 90 degrees to engage the flange of the sight base with the undercut in the screw head, and the spring plunger in the screw head with the mating detent in the sight base.

(f) Connect the short flexible shaft on the sight support to the traversing screw coupling, and the long flexible shaft to the elevating screw coupling. Be sure male and female couplings mate, and the coupling nuts are screwed on snugly.

**(5) SIGHTS (M2A1 MOUNT) (fig. 92).**

(a) Position the A.A. Sight M1, on the front end of the water jacket of the gun so that the oblong slot in the body seats over the front sight on the water jacket and the large ring is to the front.

## A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

(b) Swing the straps around under the water jacket, engage the toggle bolts with the notches in the sight body, and draw down the wing nuts until sight is secure on the water jacket.

### (6) REMAINING ASSEMBLY.

(a) Place the ammunition feed tray in position on ammunition chest support located on the left side plate. Aline inside of tray at front, and approximately even with front end of gun feedway (normal alinement). Insert screws, and draw down tight.

**NOTE:** Due to variations of gun recoil in mount, it may be necessary to deviate from the above alinement.

(b) Mount the ammunition chest securely on the left side plate of the cradle and check alinement with feed tray and the feedway in the gun.

(c) Fill the water chest if empty, and connect the water hoses of the water chest to the water jacket by screwing the coupling on the bushings. Be sure the drain valve is securely closed before filling the water jacket, then, fill the water jacket of the gun.

(d) Connect the flexible cables from the control equipment set to the traversing and elevating cables on the mount in their proper order. Be sure the male and female couplings are properly mated, and coupling nuts are screwed up snugly. Refer to section X for information on the above equipment.

(e) Insert the back rest (if removed) into its bracket on the left-hand side plate, adjust, and clamp in place by drawing down the bolts. Be sure that trigger control lever clamp is in proper alinement on the back rest bracket and the clamping screw is tight. Also check alinement and security of trigger control mechanism body on left-hand side plate of the cradle. For alinements refer to paragraph 76 d.

(f) The gun is now ready to load and operate. Before loading, be sure the cradle is locked at "O" elevation and trigger control hand lever and (hand) trigger on the gun are locked in the "SAFE" position.

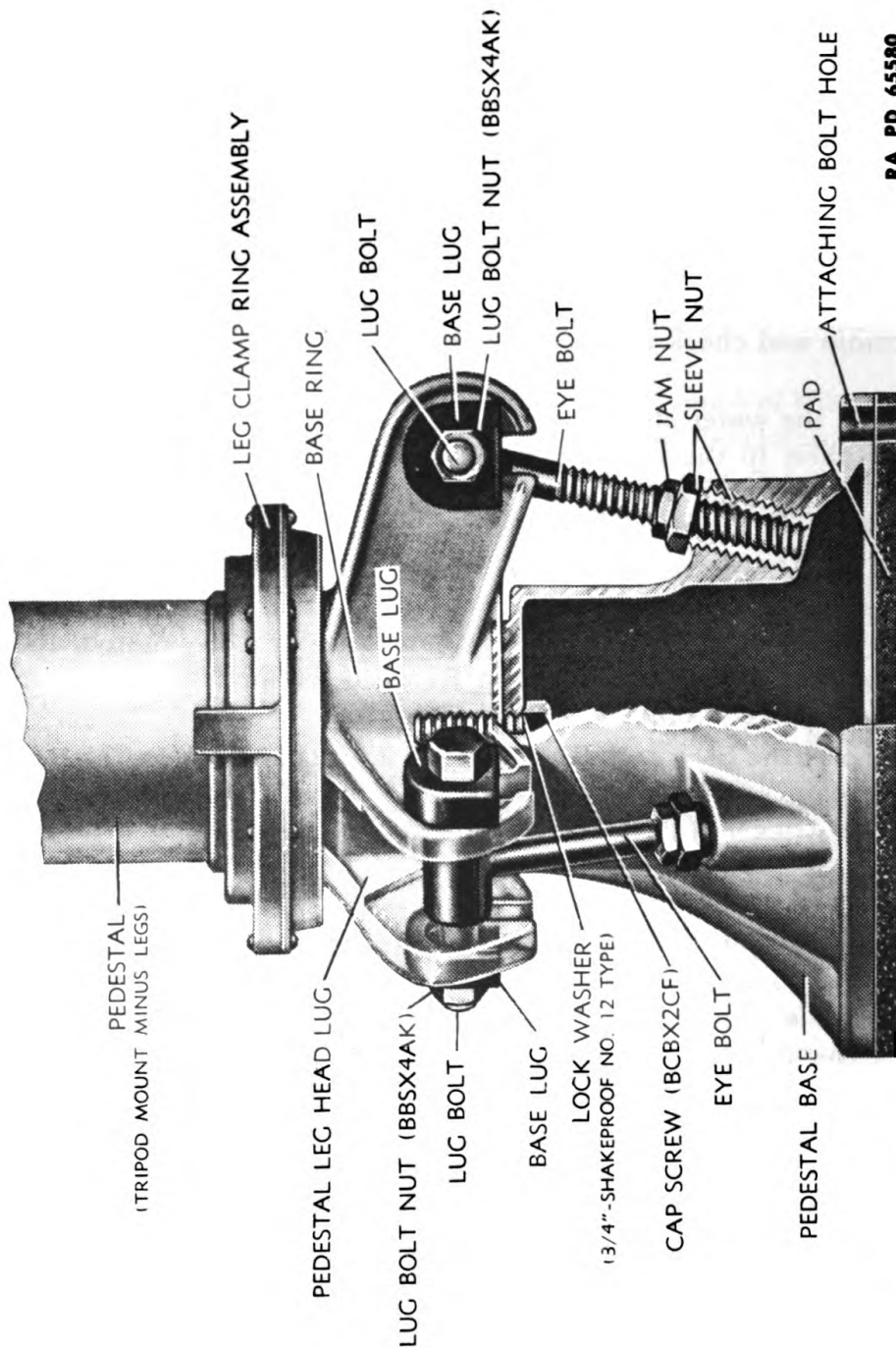
## 75. PEDESTAL BASE.

a. The pedestal base is used with the M2 and M2A1 Mounts when installed permanently on a solid foundation or deck of a vessel.

### b. Description (fig. 101).

(1) The base is circular in shape with an integral neck, is seated on a cork or "fabreeka" pad, and bolted securely with nine bolts to the foundation on which it rests. The pedestal is located on the base by means of a raised circular flange on the top of the base which fits into a counterbored mating recess in the bottom of the pedestal base support ring, and is secured to the base by a cap screw, threaded into the pedestal base support ring, and three eyebolts. These eyebolts thread, right-

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RA PD 65580

Figure 101 — Pedestal Base Attached to Pedestal — Cutaway and Phantom View — A.A. Machine Gun Mount, Cal. .50, M2 and M2A1

## A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

handed, into sleeve nuts which are threaded left-handed into bosses on the pedestal base and locked in position by jam nuts. The heads of the eyebolts, when assembled, fit in the slots in the lugs on the pedestal base ring in which the leg heads fit when assembled.

(2) Lug bolts inserted through the heads of the eyebolts and seating in the notches in the leg head lugs on the pedestal base ring are held in position by means of a base lug assembled to both ends of the bolt when assembled. These base lugs are countersunk and fit over raised bosses running around the bolt hole in the leg head lugs, on the outer faces. When the eyebolts are drawn down they pull these base lugs against the bosses through the medium of the lug bolts on which they are assembled and thus draw the pedestal down upon the base.

### c. Disassembly.

(1) To remove the pedestal from the base; first, remove the gun from the cradle and the cradle and pintle from the pedestal, then, unbolt the pedestal base from its foundations.

(2) Back off the locking nuts on the eyebolts and then, back out the sleeve nuts in the pedestal base by turning clockwise until the strain on the pedestal is relieved. Then unscrew the cap screw from the under side of the pedestal base and remove it.

(3) Unscrew the lug bolt nuts counterclockwise, part way to disengage the base lugs from the pedestal base locking ring, and lift the pedestal from the base. If the pedestal is to be reinstalled on the base in the immediate future the eyebolts and lug bolts may remain assembled to the base, otherwise it is best to remove the eyebolts with locking nut, lug bolts, and base lugs assembled, from the sleeve nuts in the base to avoid possible bending of the eyebolts. Threads of nuts and bolts should be oiled to prevent rusting.

### d. Assembly.

(1) Before assembling, lightly oil all threads and parts to prevent rusting and possible "freezing" in position.

(2) The pedestal is assembled to the pedestal base by first screwing the sleeve nuts counterclockwise into the bosses on the base until about  $\frac{3}{4}$  inch of thread remain outside the boss for adjustment. (The sleeve nuts are threaded left-handed.)

(3) Screw a jam nut well up on each eyebolt, and then, screw the eyebolts clockwise into the sleeve nuts so that the cylinder which forms the eye will lie at right angles to the center of the base, and center of the eye will lie approximately  $\frac{1}{2}$  inch above the top of the base. This positioning is to place the eye in line with the slot in the leg head lugs and the center of the eye in line with the center of the lug bolt when assembled. The  $\frac{3}{4}$  inch of remaining thread on the sleeve nut is left to provide a means of further alining the eye and drawing down the pedestal when assembled to the base.



**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

(4) With the three eyebolts thus positioned, seat the pedestal on the base, so that the heads of the eyebolts mate with the leg head slots in the pedestal base ring, and the raised flange on the top of the base is seated securely in the counterbored recess in the bottom of the base ring of the pedestal.

(5) Place the lock washer **BEAX2E** on the cap screw **BCBX2CF**, insert it through the hole in the top of the base from the under side, and screw into the threaded hole in the pedestal base support ring into which the hook group is screwed when assembled to the tripod mount.

(6) Place a base lug on a lug bolt with the flat side towards the head of the bolt and with the rounded end facing up, then, insert the threaded end of the bolt into the slot in the leg head lug of the pedestal so that the counterbore in the base lug seats evenly over the raised boss on the leg head lug. Then, raise or lower the eyebolt, by turning the sleeve nut in the base, until the lug bolt will enter the hole in the eyebolt. Push the lug bolt through the eyebolt and opposite side of the leg head lug and place another base lug on the bolt so that the counterbore seats over the raised boss on the leg head lug. Then, screw on the lug bolt nut and draw tight. Be sure the base lugs are fully and evenly seated over the raised bosses before tightening the nut. Assemble the other two eyebolts in a similar manner.

(7) Check to see that the pedestal is seated evenly on the base, and then draw it down tight on the base by turning the sleeve nuts in the base *counterclockwise*. This will draw down the eyebolts, and hence the lug bolts and pedestal through the medium of the base lugs bearing on the raised bosses on the leg head lugs on the pedestal base ring. Turn down the three sleeve nuts gradually a little at a time so as to draw down the eyebolts evenly.

(8) Draw the pedestal down *tight*, and then screw down the jam nuts on the eyebolts to lock the sleeve nuts in position.

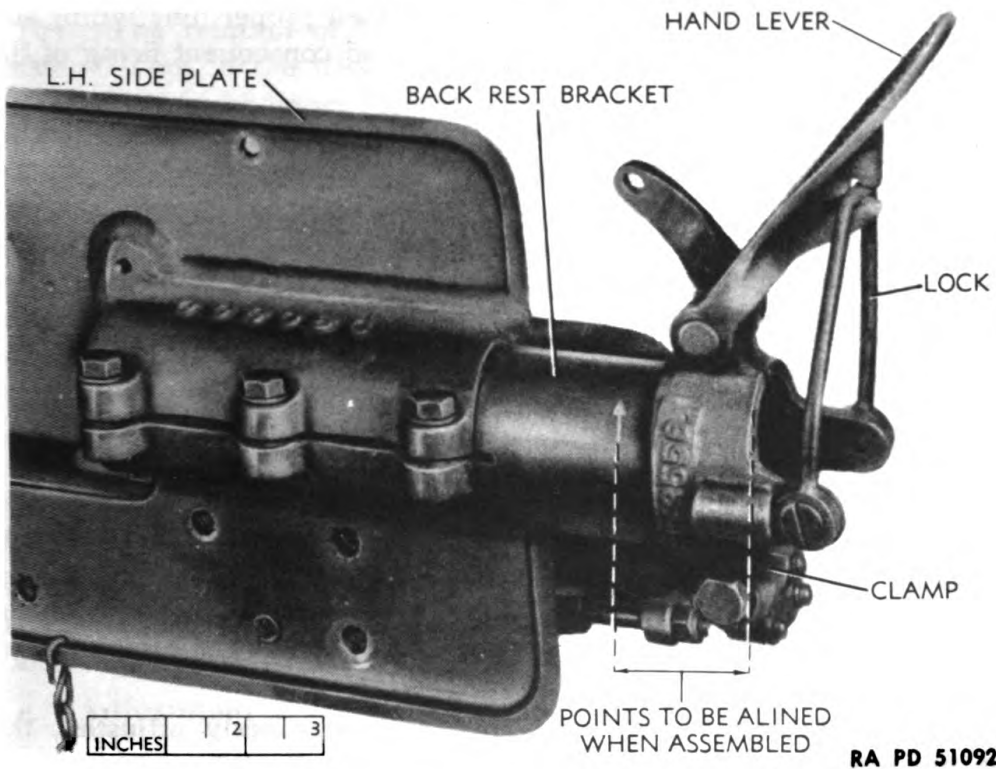
(9) Take up any looseness in the cap screw in the center of the base caused by drawing down the pedestal on the base.

## **76. ADJUSTMENTS.**

a. **General.** Adjustments of the mount may be classed as changing and fixed. Changing adjustments apply to the pintle and cradle for transverse and elevation of the gun when firing. Fixed adjustments apply to the positions of the trigger control mechanism on the cradle, the racks and gears on the cradle, and the tension of the recoil and counterrecoil springs in the recoil mechanisms. Such fixed adjustments are made when the mount is assembled, but in case the parts should get out of adjustment through use or other causes, the proper adjustments are given below.

b. **Pintle Adjustment.** There is no further adjustment of the pintle necessary after it is mounted in the pedestal. It should revolve

**A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1**



**Figure 102 — Showing Points on Trigger Control Clamp and Back Rest Bracket to be Alined When Assembled — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

freely at all times through an arc of 360 degrees.

c. **Cradle Adjustment.** The cradle can be adjusted in elevation to any angle between minus 15 degrees and plus 68.75 degrees from the horizontal. Adjustment is made by unclamping the cradle side plates from the pintle by turning the cradle clamping handle counterclockwise, raising or lowering the angle of the cradle (and hence the gun muzzle), and then reclamping by turning the handle clockwise. Free movement of the cradle for elevation and azimuth is obtained by allowing the handle to remain in the unlocked position.

d. **Adjustment of Trigger Control Mechanism** (figs. 85 and 102).

(1) The trigger control mechanism is composed of two groups; the slide and body together with the component springs and parts, and the hand lever together with its mounting clamp and component parts. As already explained, the slide group is mounted on the left side plate of the cradle and the lever group is mounted on the back rest bracket welded to the same side plate. These two groups are connected by the links and crank mounted on the body which houses the slide. The position of these two groups, both with respect to the cradle (and gun)

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

and each other, is most important both for their proper functioning and that of the side plate trigger on the gun, and consequent firing of the gun.

(2) The slide group must be assembled to the side plate in such a position that the operating lug on the slide will lie in the proper position with respect to the operating lug on the side plate trigger on the gun, when the mount is in the horizontal position. When properly adjusted, this position is maintained by the action of the gears, racks, and compensating spring of the lower recoil mechanism, which maintains the gun in its proper position in the mount when the mount is elevated or depressed as already explained (pars. 72 and 73). The slide group is positioned by alining the body, which houses the slide, properly on the side plate so as to bring the slide operating lug into the proper position with respect to the operating lug on the side plate trigger slide. A slight adjustment of the slide in the body is possible by adjustment of the nut on the rear end of the spring guide which bears upon the rear end of the slide. This adjustment is, however, mainly to obtain proper spring tension and clearance of the guide with the cap pin, when assembling.

(3) With the lower buffer mechanism properly adjusted, the proper position of the trigger control body with relation to the side plate of the mount is designated by alining marks on the upper edge of the body and on the upper beveled edge of the left side plate (fig. 85). These alining marks are cut into the metal and lie over the forward, top (attachment) screw hole of the trigger control body (fig. 85). The attaching screw holes in the body are elongated to allow for slight longitudinal adjustment of the body. When the alining marks are in alinement, the body and slide should be in the correct position on the mount with regard to the side plate trigger slide on the gun, with the cradle horizontal. When properly alined, the forward face of the body should be approximately  $6\frac{17}{32}$  inches from the center line of the cradle trunnions.

(4) With the trigger control slide group properly positioned with respect to the side plate trigger, the hand lever must be positioned so that it will properly operate the slide. This is accomplished by the positioning of the hand lever clamp on the back rest bracket of the cradle side plate. When properly positioned, the rear face of the clamp should aline with the alining mark cut into the back rest bracket (fig. 102). The distance from the rear end of back rest bracket to the rear face of the hand lever clamp, when so positioned, should be  $1\frac{1}{32}$  inches.

(5) There is no adjustment in the links or crank; the only remaining adjustment, therefore, is of the eye on the guide rod. When the slide group is properly alined, as above, the eye should be so positioned on the guide so that the distance between the rear face of the slide and the forward face of the eye is approximately  $\frac{5}{16}$  inch.

## A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

(6) The relation of the slide and hand lever groups must be constant. Thus, if the trigger control body is shifted slightly for adjustment, the lever clamp must be shifted the same amount and in the same direction, so as to avoid placing excess load on the springs or linkage. To spread the groups will place unnecessary loads on various parts, and to contract them will cause loss of part of the hand lever throw. Setting of the body and bracket should be within  $\frac{1}{16}$  inch of the alinement marks for proper functioning.

(7) Adjustment of the above parts is accomplished by loosening the screws and nuts pertaining to the part in question. Nuts and screws should be securely tightened after adjustment is made. When properly adjusted, and the hand lever in the "normal position", the lug on the trigger control slide should hold the side plate trigger slide fully forward, the collar on the spring guide bear upon the shoulder in the body, and the end of the guide clear the pin on the spring clip on the slide as shown in figure 97. The proper position of the slide, with respect to the side plate trigger slide when in the "locked" and "fired" position, is also shown in figure 97.

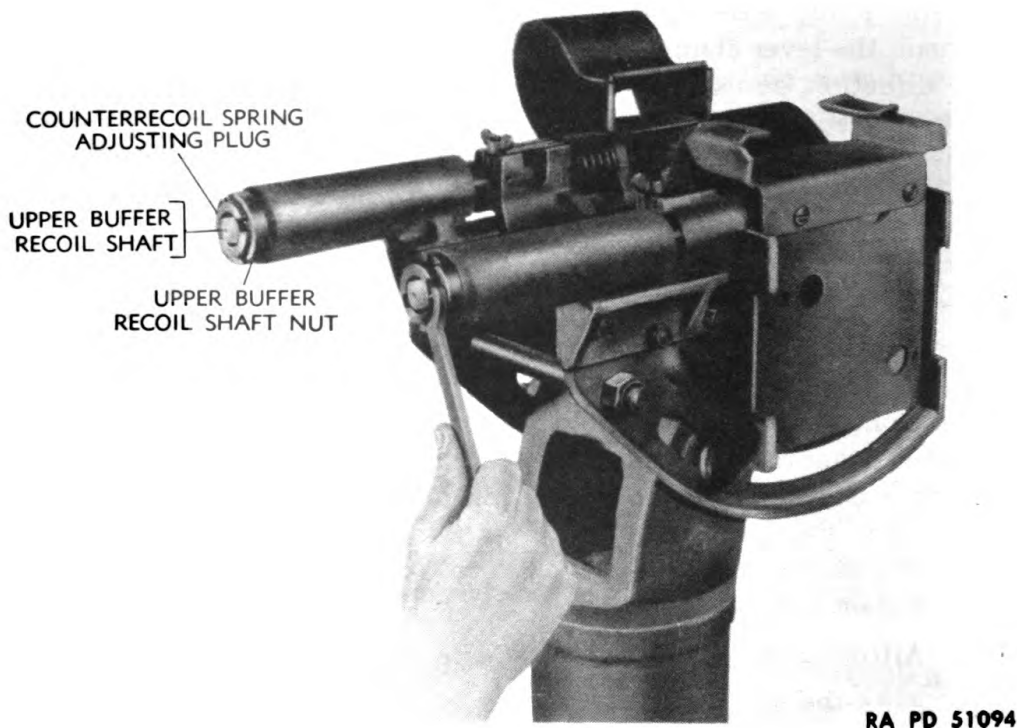
### e. Adjustment of the Recoil Mechanisms.

(1) As the gun recoils, the slide in the lower recoil mechanism moves to the rear with the gun, compressing the lower recoil and compensating spring, and the upper buffer recoil springs. The built up spring pressure brings the gun to rest at the end of the recoil movement and returns it to battery during counterrecoil. The counterrecoil of the gun is absorbed by the upper buffer counterrecoil springs. The firing mechanism is so arranged (as already explained) that the gun cannot be fired until it reaches a predetermined point in the path of counterrecoil, which is determined by the location of the lug on the trigger control slide which contacts the side plate trigger. Whether the gun fires at this point or later depends upon the relation of the moving parts of the gun mechanism, that is, the sear slide must be in position to be disengaged by the cam of the side plate trigger which it strikes as it moves forward in the gun. The counterrecoil movement of the gun is finally checked by the recoil impulse of the shot. When firing a single shot, or on the last shot, the upper buffer counterrecoil springs absorb the final energy of counterrecoil.

(2) Recoil may vary, however, due to variation in energy of cartridges, friction in links, pull, etc., and the potential energy, built up in the recoil springs during recoil for returning the gun to battery, may therefore vary. Such variations can be taken care of by adjustment of the recoil and compensating springs.

(3) *The gun must not be allowed to come into battery so that there is a metal-to-metal contact of the trunnion slide with the rear face of the forward section of the slide bracket on the mount.* Such a

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



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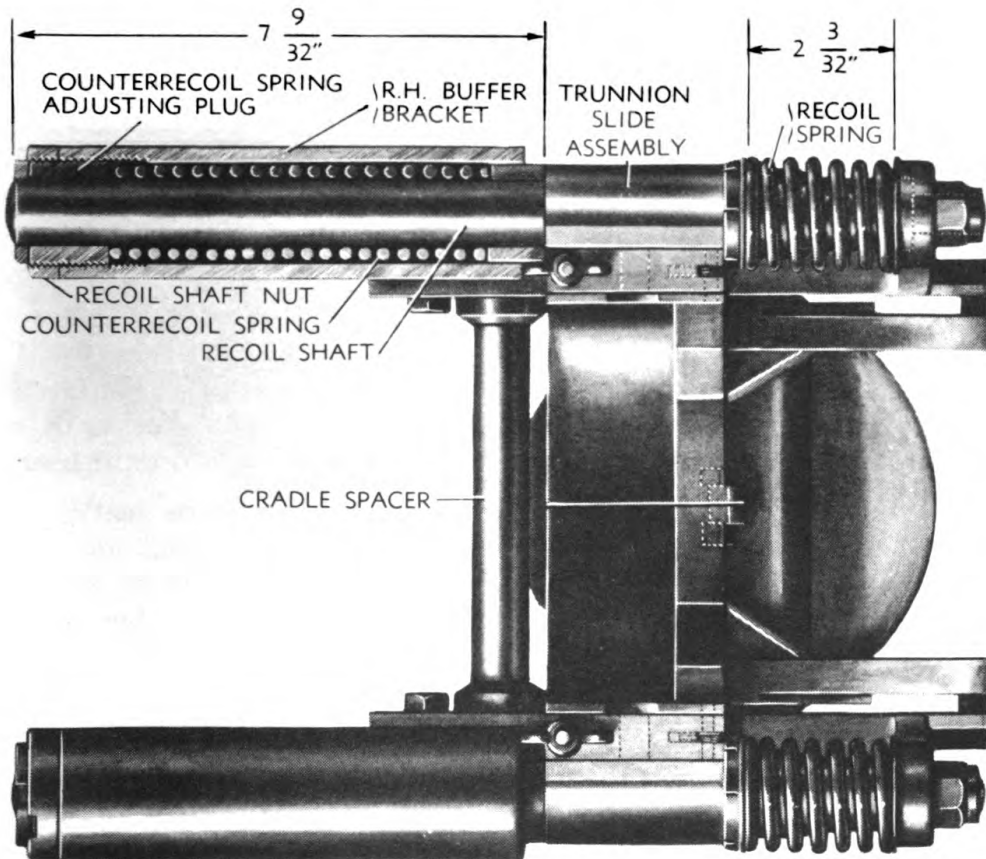
**Figure 103 — Adjusting Upper Buffer Counterrecoil Spring —  
A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

tendency is avoided by increasing the tension on the counterrecoil springs as explained below. However, counterrecoil must be sufficient for the side plate trigger to be operated by the trigger control mechanism.

(4) The recoil mechanism is adjusted for normal recoil of the gun at "O" elevation. However, if the muzzle is elevated, the gun will sag against the recoil springs due to its weight, and thus reduce their potential recoil and counterrecoil energy, and the recoil potential will thereby vary. Constant recoil is obtained by the compensating spring, which takes the weight of the gun through the slide, and is acted upon by adjusting head, racks, and gears as explained in paragraph 73 c. During depression of the muzzle from "O" elevation, no change takes place in the spring adjustment, and the movement of the gears and racks is compensated by the extended turned surface in the space between the rear end of the racks and the rack nuts.

(5) **ADJUSTMENT OF UPPER BUFFER RECOIL SPRINGS.** There is no adjustment possible on these springs. The nuts on the rear end of the recoil shafts should be tight so as to draw the shafts tightly into the brackets. Free length of these springs is 2.43 plus or minus 0.015 (approx.  $2\frac{1}{2}$ ) inches.

**A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1**



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**Figure 104 — Adjustment of Upper Buffer Counterrecoil Spring —  
A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

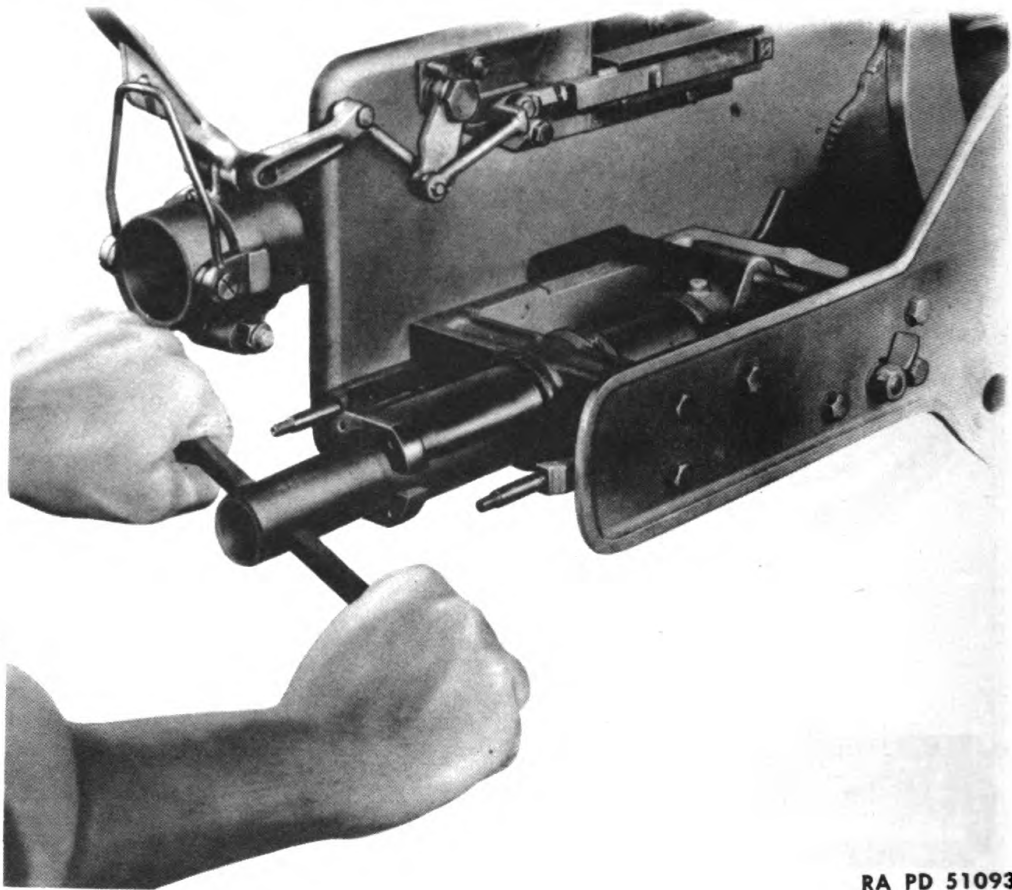
(6) **ADJUSTMENT OF UPPER BUFFER COUNTERRECOIL SPRINGS** (fig. 103). With trunnion slide assembly set and blocked to hold upper buffer recoil springs at assembled height of  $2\frac{3}{32}$  inches, counterrecoil spring adjusting plugs are set so that their front faces (face with the slots) are  $7\frac{9}{32}$  inches ahead of the front faces of trunnion slide assembly (fig. 104). The springs are adjusted, when necessary, by screwing in or unscrewing the adjusting plugs with a spanner wrench after removing the locking nuts. The locking nuts should be assembled and securely tightened after adjustment. Care should be observed to adjust both springs evenly. Screwing in the plug checks the gun earlier in counterrecoil. Unscrewing the plug (counterclockwise) reduces the counterrecoil spring load. The free length of these springs is 6.34 plus or minus 0.015 (approx.  $6\frac{5}{16}$ ) inches.

**CAUTION:** If these springs are removed, care should be taken to avoid injury to personnel, as the springs are under high tension.

(7) **ADJUSTMENT OF LOWER BUFFER RECOIL SPRING** (fig. 105).



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**Figure 105 — Adjusting Lower Buffer Recoil Spring — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1**

(a) Adjustment of the recoil mechanism is for the most part made by adjustment of this spring. When assembled, the normal setting of this spring is such that the distance between the rear face of the recoil spring adjusting plug (within the housing) and the rear face of the housing is  $4\frac{7}{8}$  inches. Care should be observed that this measurement is taken from the rear face of the plug and *not* from the bottom of the wrench slot which is  $\frac{3}{16}$  inch deep. Each complete clockwise turn of the plug increases the compression of the spring approximately  $3\frac{1}{2}$  pounds.

**CAUTION:** When adjusting the recoil spring, do not position the plug closer to the end of the recoil housing than  $4\frac{7}{8}$  inches (normal setting). This setting prevents a metal-to-metal contact at maximum elevation, and gives full adjustment forward for the spring reserve. This spring has a stress below 60,000 pounds per square inch and should require little if any adjustment. The spring must be cleaned occasionally and, unless plated, must under normal conditions, be covered with a light grease to prevent corrosion.

## A.A. MACHINE GUN MOUNTS, CAL. .50, M2 AND M2A1

### (b) *To Adjust the Spring.*

1. With the gun dismounted and cradle clamped at "O" elevation, remove the screws from the housing plate. Then, loosen the nuts on the rear end of the racks, and holding the adjusting head against spring force, remove the nuts and pull out the adjusting head, with compensating spring guide rod and spring attached, from the rear end of the housing.

2. Adjust the spring by inserting the adjusting wrench into the rear end of the housing, engaging it with the adjusting plug and turning the plug in the desired direction (fig. 105). If plug and spring are to be removed, bear upon the wrench slightly, while unscrewing the plug, to prevent the plug from pushing the wrench out forcibly when released from its threads in the housing.

3. When adjustment has been made, assemble the parts to the housing by sliding the compensating spring on the guide rod. Then, insert the group into the housing, and seat rod in adjusting plug in forward end of slide. Press adjusting head against force of compensating spring, and screw on the rack nuts. Then, fasten the plate tightly with the screws. Be sure that the threads of the plug (if removed) do not cross when starting, and that the guide rod seats in the compensating spring adjusting plug in the slide, before reinstalling the rack nuts and housing cap screws. Be sure that the distance between recoil spring adjusting plug and rear of housing is not less than  $4\frac{7}{8}$  inches, as explained in subparagraph e (7) (a) above. (If, in this position, metal-to-metal contact occurs between the slide and bracket of the upper buffer recoil mechanism, the counterrecoil springs should be adjusted sufficiently to prevent it by screwing in the adjusting plugs.) Free length of the recoil spring is 6.34 plus or minus 0.015 (approx.  $6\frac{5}{16}$ ) inches. This spring is identical with the upper buffer counterrecoil springs.

(8) ADJUSTMENT OF COMPENSATING SPRING. No adjustment of this spring is normally required. When assembled, the adjusting plug should be flush with the locking nut, and the nut should be tight and secured by the lock washer bent slightly into the wrench slot. Free length of this spring is approximately  $12\frac{5}{16}$  inches.

(9) ADJUSTMENT OF RACKS AND GEARS. No adjustment of these parts is required. When assembled, punch marks on the gears denote their proper setting with the cradle at "O" elevation. The small hole in the transfer gears should lie in a perpendicular line between the center of their pivot studs and the racks.

## 77. CARE AND CLEANING.

a. Care, cleaning and lubrication of the mounts, together with the oils and lubricants used, are covered in paragraphs 31 and 32.



**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

**Section VIII**

**A.A. MACHINE GUN MOUNT, CAL. .50, M3**

	Paragraph
General .....	78
Description .....	79
Functioning .....	80
Dismounting and mounting the gun and mount groups.....	81
Adjustments .....	82
Care and cleaning .....	83

**78. GENERAL.**

a. The M3 Mount (figs. 106 and 107) is an antiaircraft mount for use with the Browning Machine Gun, cal. .50, M2, Water-cooled, covered in this manual. It can also be used with other Browning Machine Guns, cal. .50, M2, but such use is not covered herein.

b. The mount can be assembled as a tripod mount for ground or vehicular use by attaching three legs to the bottom of the pedestal. It can also be assembled as a pedestal mount for use on a fixed foundation or deck of a vessel, by attaching a pedestal base to the base plate on the bottom of the pedestal, in place of the three legs.

c. In general, the principle of traversing and elevation is similar to that of the M2 and M2A1 Mounts described in section VII. Its construction permits a traversing arc of 360 degrees, depression of 15 degrees, and elevation of 90 degrees from the horizontal. The trigger control (slide) mechanism is the same in general design and principle as that of the M2 and M2A1 Mounts, although differing in details. The trigger control operating mechanism is, however, quite different from that of the above mounts. It consists of a tubular frame (figs. 114 and 115), fastened to the rear of the cradle side plates, on which six control grips are assembled in pairs, one above the other. It is this construction that allows the operator to remain in an up-right position while operating the mount instead of reclining in the back rest as in the case of the M2 and M2A1 Mounts.

d. There is no compensating mechanism in this mount as in the M2 and M2A1 Mounts. The sights are clamped to the water jacket of the gun as in the case of the M2A1 Mount, and similar in design (fig. 117).

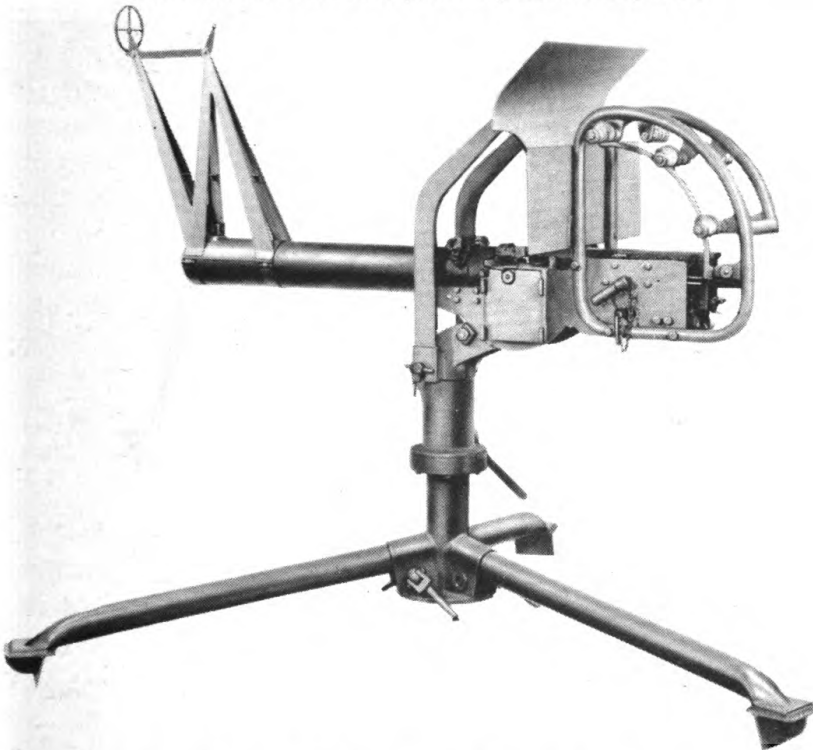
e. The M3 Mount is of recent design and may, therefore, be subject to minor changes which must be so considered when dealing with this mount as covered herein. For general data pertaining to the mount, refer to paragraph 4, and for detailed construction and arts refer to SNL A-37.

**A.A. MACHINE GUN MOUNT, CAL. .50, M3**



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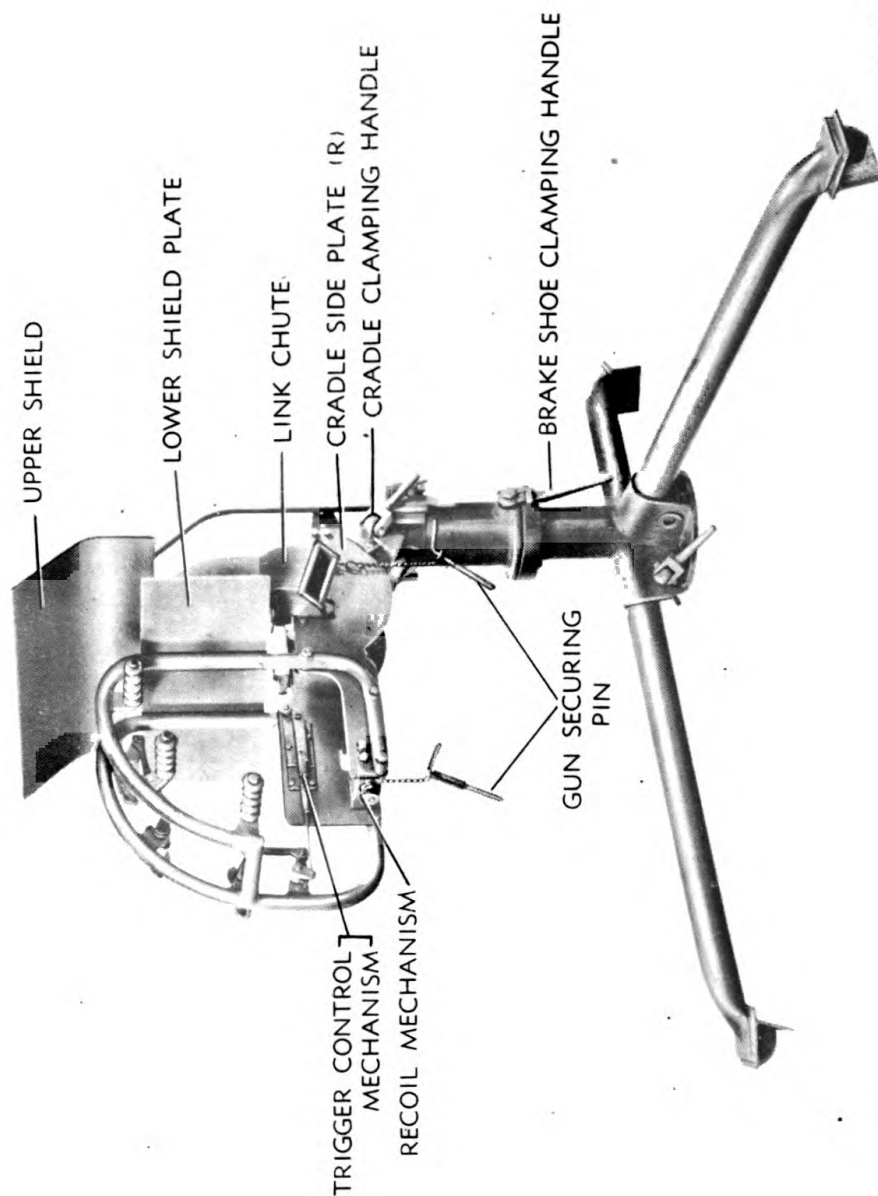
**Figure 106 — Gun and Sight Mounted — Right Side View —  
A.A. Machine Gun Mount, Cal. .50, M3**



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**Figure 107 — Gun and Sight Mounted — Left Side View —  
A.A. Machine Gun Mount, Cal. .50, M3**

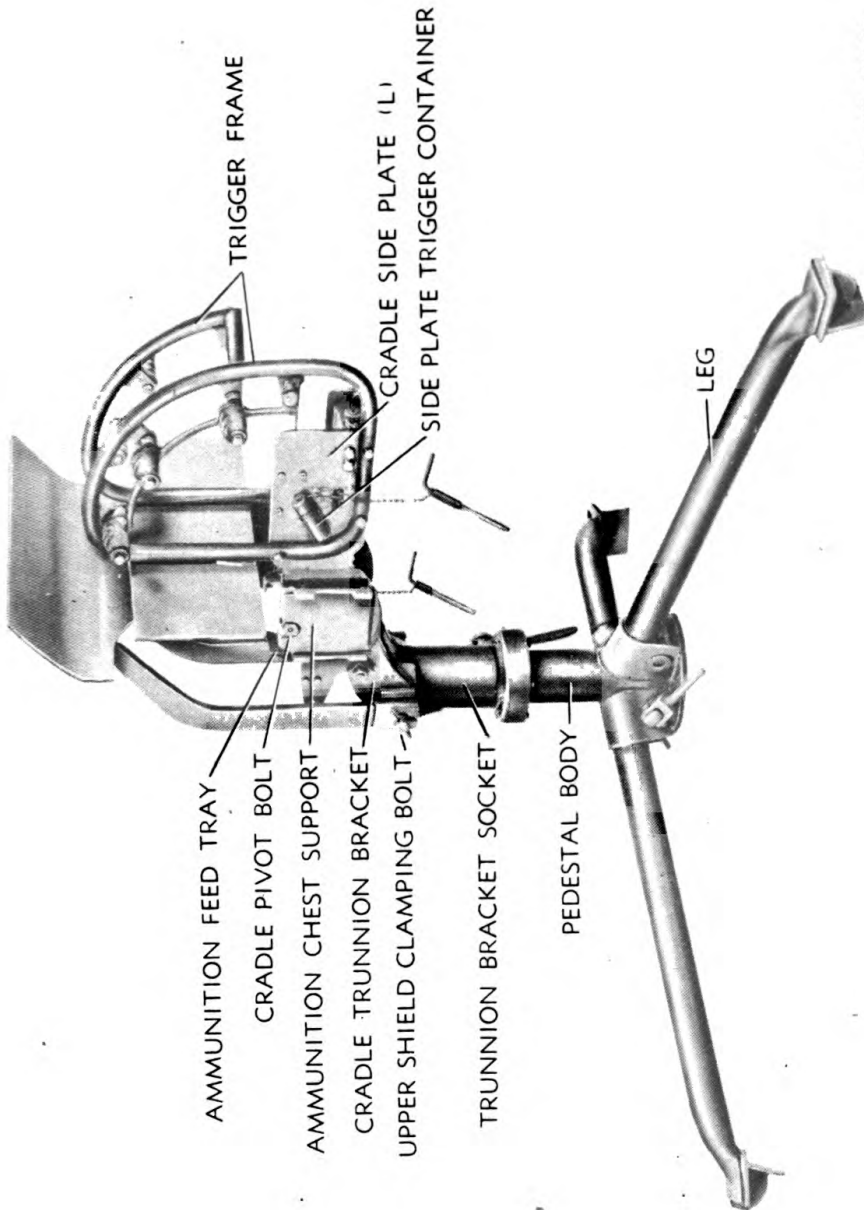
**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**



RA PD 51102

**Figure 108 — Right Side View — A.A. Machine Gun Mount, Cal. .50, M3**

A.A. MACHINE GUN MOUNT, CAL. .50, M3



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Figure 109 — Left Side View — A.A. Machine Gun Mount, Cal. .50, M3

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS****79. DESCRIPTION.**

a. **General.** The M3 Mount (figs. 108 and 109) is, in general, composed of three groups of assemblies and parts; the pedestal, the legs (or base), and the cradle (fig. 118). The recoil mechanism is assembled in the cradle, the trigger control mechanism to the left side plate of the cradle, and the trigger frame to both side plates. Two protection shields are attached to the mount; one to the trigger frame, and the other to supports, clamped in slots in the trunnion bracket. When models of the Browning Machine Gun, cal. .50, M2, other than the water-cooled gun are used with this mount, a counter-weight is assembled to the front of the cradle to balance gun and cradle when assembled.

b. **Pedestal Group** (fig. 111).

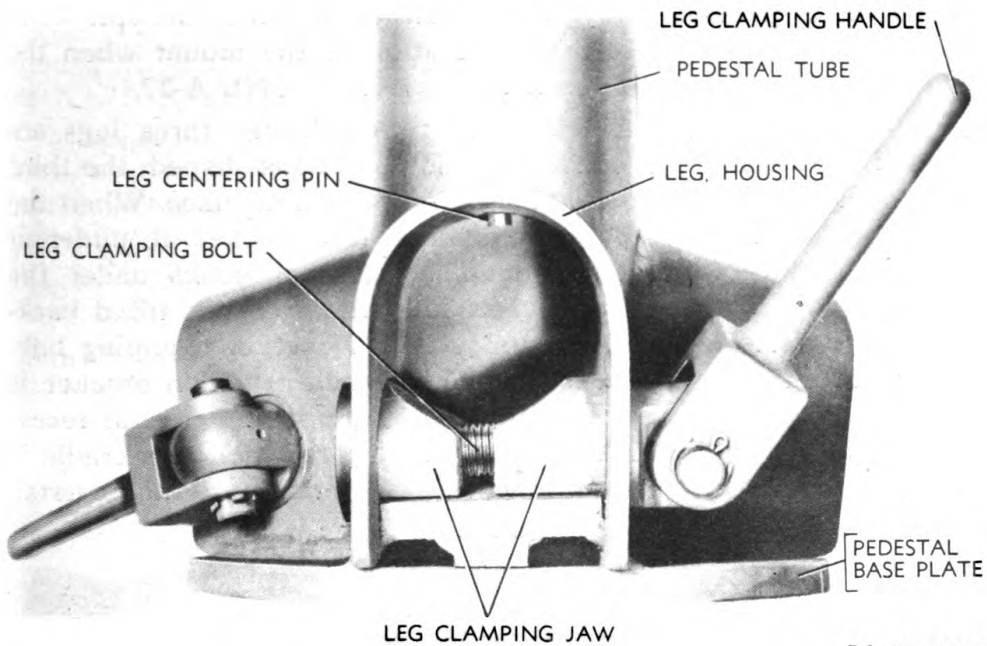
(1) The pedestal group is composed of a cylindrical body upon which is mounted a cylindrical cap called the trunnion bracket socket. The body, which is the lower portion of the group, has three leg housings welded to its lower end. These leg housings rest upon, and are welded to, a circular plate also welded to the pedestal and the sockets. There are holes in the plate to bolt the pedestal to the pedestal base when used in place of the legs.

(2) Each leg housing is furnished with a seating pin in the top which mates with a slot in the leg when assembled. In the bottom of the housing are two opposing wedge-shaped jaws, one of which is threaded on a bolt which passes through the housing and jaws. This bolt is screwed in or out of the jaws by means of a hinged clamping handle to pull the jaws together or separate them, thereby, clamping or releasing the leg in the housing, when assembled or disassembled.

(3) Midway up the pedestal body a projecting ring housing is assembled in which a radial ball bearing is seated and insulated with packing at sides, top and bottom to absorb vibration. The trunnion bracket socket, sliding over the top of the pedestal body, seats on, and is bolted to, this housing. The inner ring of the ball bearing rests upon a split retaining ring sprung into a groove in the pedestal body, and takes the weight of the upper portion of the mount and the gun in conjunction with the split cone described in step (4) below. The bearing is held in position by a second retaining ring, which is sprung into a groove in the body above the ball bearing, and locks it in position. As the trunnion bracket socket is bolted to the bearing housing, it also is thus locked to the pedestal body when assembled.

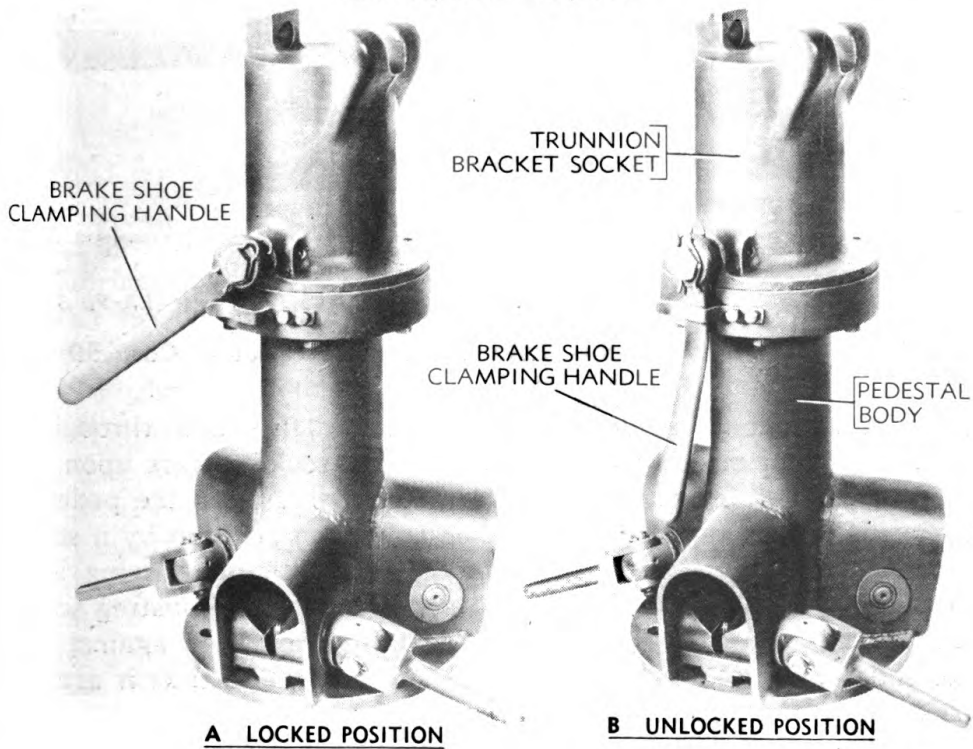
(4) Two opposing steel cones, seated in a double-ended split cone, are assembled in the tube of the pedestal body. Between the cones, fabric packing is assembled, and the parts are drawn together and held by a hexagonal-headed screw threaded into one of the cones, and a lock washer. The upper cone bears in the top of the trunnion bracket socket and the lower cone seats on a filler plate resting on a

**A.A. MACHINE GUN MOUNT, CAL. .50, M3**



RA PD-51108

**Figure 110 — Pedestal Body Showing Leg Housing — A.A. Machine Gun Mount, Cal. .50, M3**



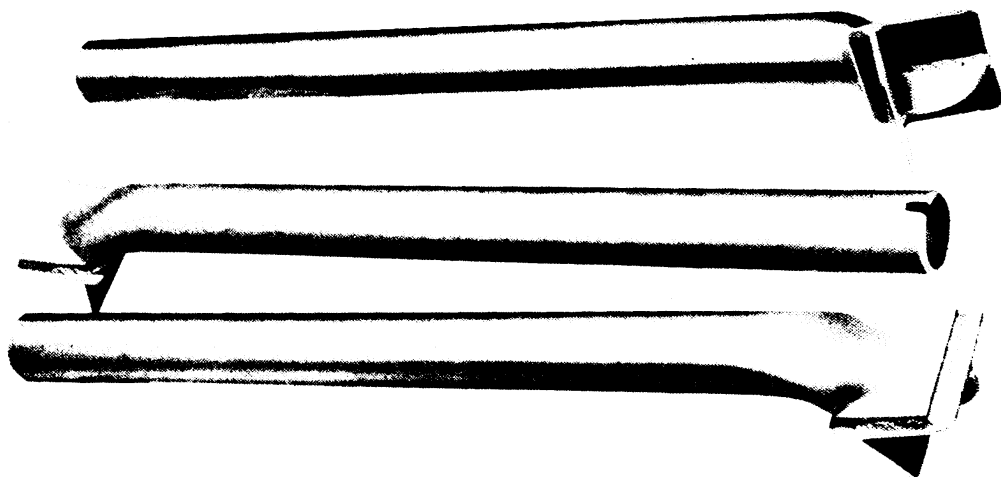
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**Figure 111 — Pedestal Group Showing Brake Shoe Clamping Handle in Locked and Unlocked Positions — A.A. Machine Gun Mount, Cal. .50, M3**

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

shoulder in the pedestal body. The expansion action of the split cone and packing serves to absorb the vibration of the mount when the gun is firing. For details of construction, refer to SNL A-37.

(5) On the top of the trunnion bracket socket, three lugs are formed. Two of these lugs are side-by-side and hook-shaped; the third lug is opposite, and has a circular recess in its inner face. When the cradle group is mounted to the trunnion bracket socket, an undercut lug on the front of the cradle trunnion bracket hooks under the twin hook-shaped lugs on the socket. The cradle is then tilted backward until it rests level on the top of the socket. A clamping bolt, threaded through the undercut lug on the cradle trunnion bracket, is then screwed in until the nose of the bolt seats in the circular recess in the single lug of the socket. By tightening this bolt, the cradle is firmly clamped to the trunnion bracket socket and hence the pedestal.

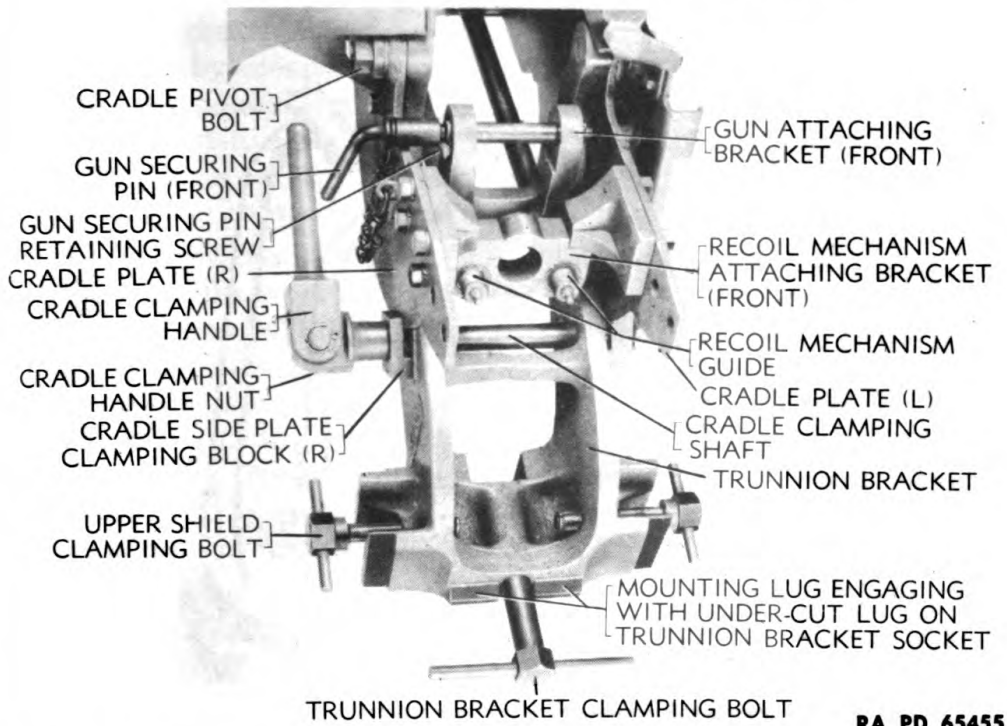


RA PD 51109

**Figure 112 — Leg Assemblies — A.A. Machine Gun Mount, Cal. .50, M3**

(6) A hexagonal-headed adjusting screw, threaded through a boss on the lower end of the trunnion bracket socket, bears upon the shank of a curved brake shoe, which in turn bears upon the pedestal body inside the socket. This brake shoe is held in position by a small set screw threaded through the side of the boss and bearing in a groove in the shank of the brake shoe upon which the adjusting screw bears. As the adjusting screw is screwed into the boss against the brake shoe, it forces it against the pedestal body, and thus it acts as a brake to prevent rotation of the socket, and hence the cradle and gun, on the pedestal body. The adjusting screw is turned by means of a lever handle shaped like a closed-end wrench which fits over the hexagonal head of the screw, and is held in position by two wire spring clips. The brake shoe is held in the disengaged position by a flat spring clip on the side of the pedestal, under which the lever handle

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RA PD 65455

**Figure 113 — Front End of Cradle Group — A.A. Machine Gun Mount, Cal. .50, M3**

slips, and is held, when rotated downward, to a vertical position (fig. 111). The opening in this lever handle also fits the cradle pivot bolts, and may be used to adjust them when necessary.

(7) The ball bearing in the pedestal is packed in grease, and is lubricated by means of a lubrication (grease) gun which is attached to a lubrication (grease) fitting threaded into the lower end of the trunnion bracket socket. The pedestal body and trunnion bracket socket form a group which should not be disassembled except for repair by qualified ordnance personnel.

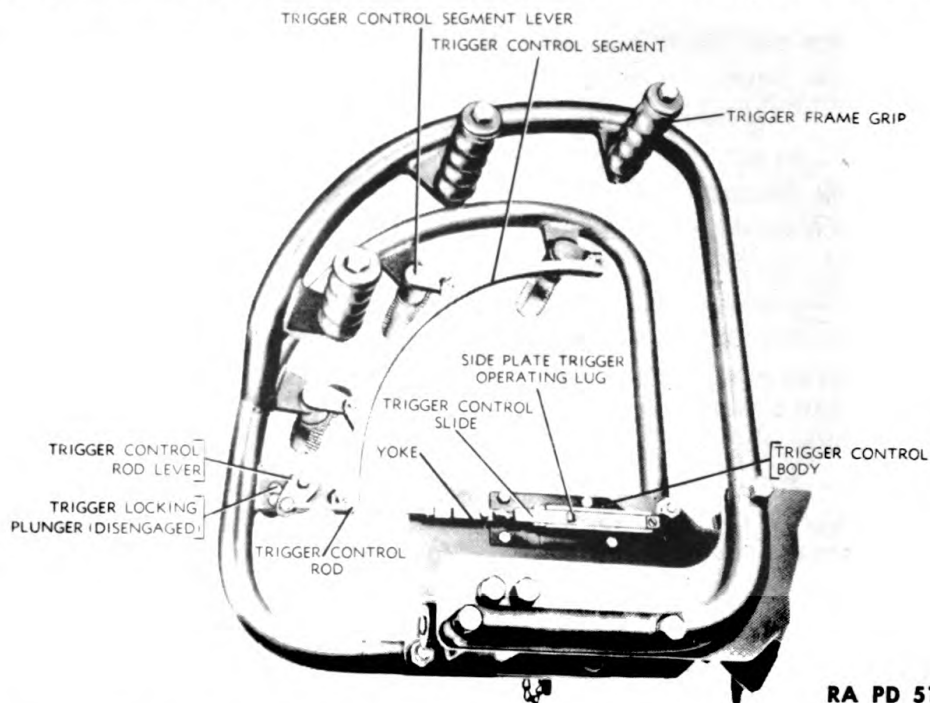
c. **Tripod Legs** (fig. 112). The tripod legs are tubular with a spade foot on one end and a slot in the other end which mates with the positioning pin in the leg housing of the pedestal, as described in subparagraph b above. The legs are assembled to the pedestal by inserting the slotted end into the housing, so that the pin in the housing seats in the slot, and then clamping them in position by means of the clamping bolt and wedge-shaped jaws described in subparagraph b above.

d. **Cradle Group** (figs. 113, 114, 115, and 116).

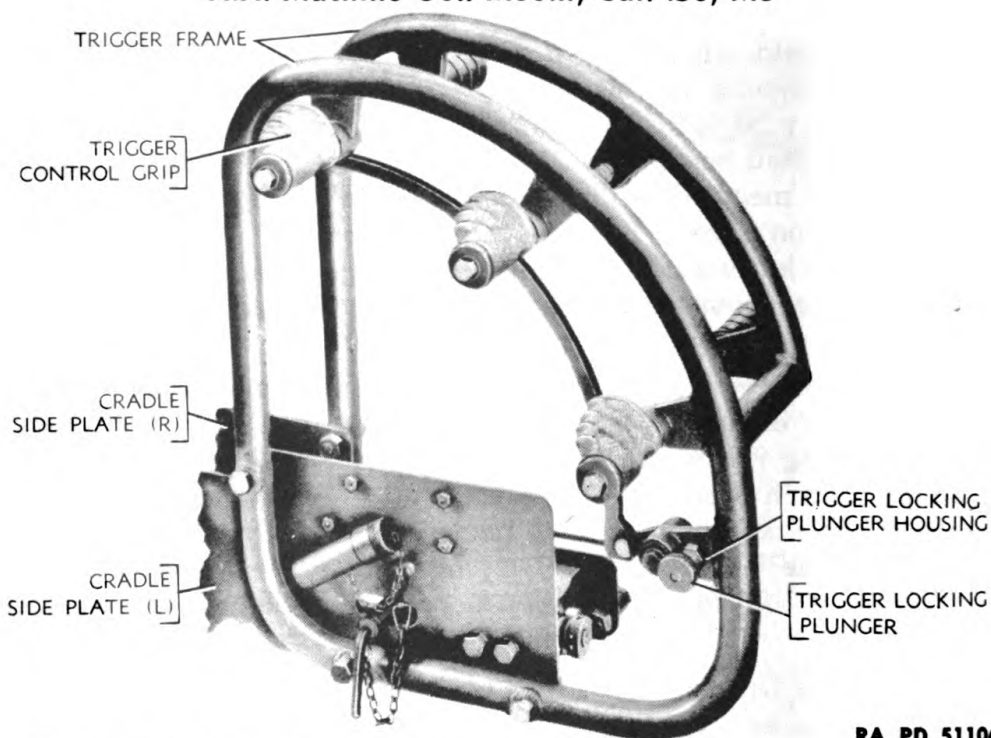
(1) The cradle is composed of a right and left side plate bolted to a front and rear recoil mechanism attaching bracket. The right and left side plates act as spacers. In these brackets, the recoil mechanism is assembled.



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**Figure 114 — Rear End of Cradle Group Showing Trigger Control Mechanism and Trigger Group — Right Side View — A.A. Machine Gun Mount, Cal. .50, M3**



**Figure 115 — Rear End of Cradle Group Showing Trigger Control Mechanism and Trigger Group — Left Side View — A.A. Machine Gun Mount, Cal. .50, M3**

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(2) The cradle, thus formed, is pivoted to the horns of the trunnion bracket by means of two pivot bolts. The trunnion bracket is, in turn, seated and clamped in the head of the trunnion bracket socket attached to the pedestal. In this mount, the trunnion bracket and socket together, correspond to and perform the function of the pintle, common to most mounts.

(3) The cradle pivots for elevation and depression upon the cradle pivot bolts, and can be locked in any position of elevation or depression between minus 15 degrees and plus 90 degrees from horizontal, by means of compression clamps acting upon the radial rim of the side plates. These clamps are drawn together by means of a nut threaded to the cradle clamp shaft which extends through the clamps and the trunnion bracket, thus squeezing the plates against the bracket, and holding them by friction. The clamping nut is operated by a hinged clamping handle attached to the nut.

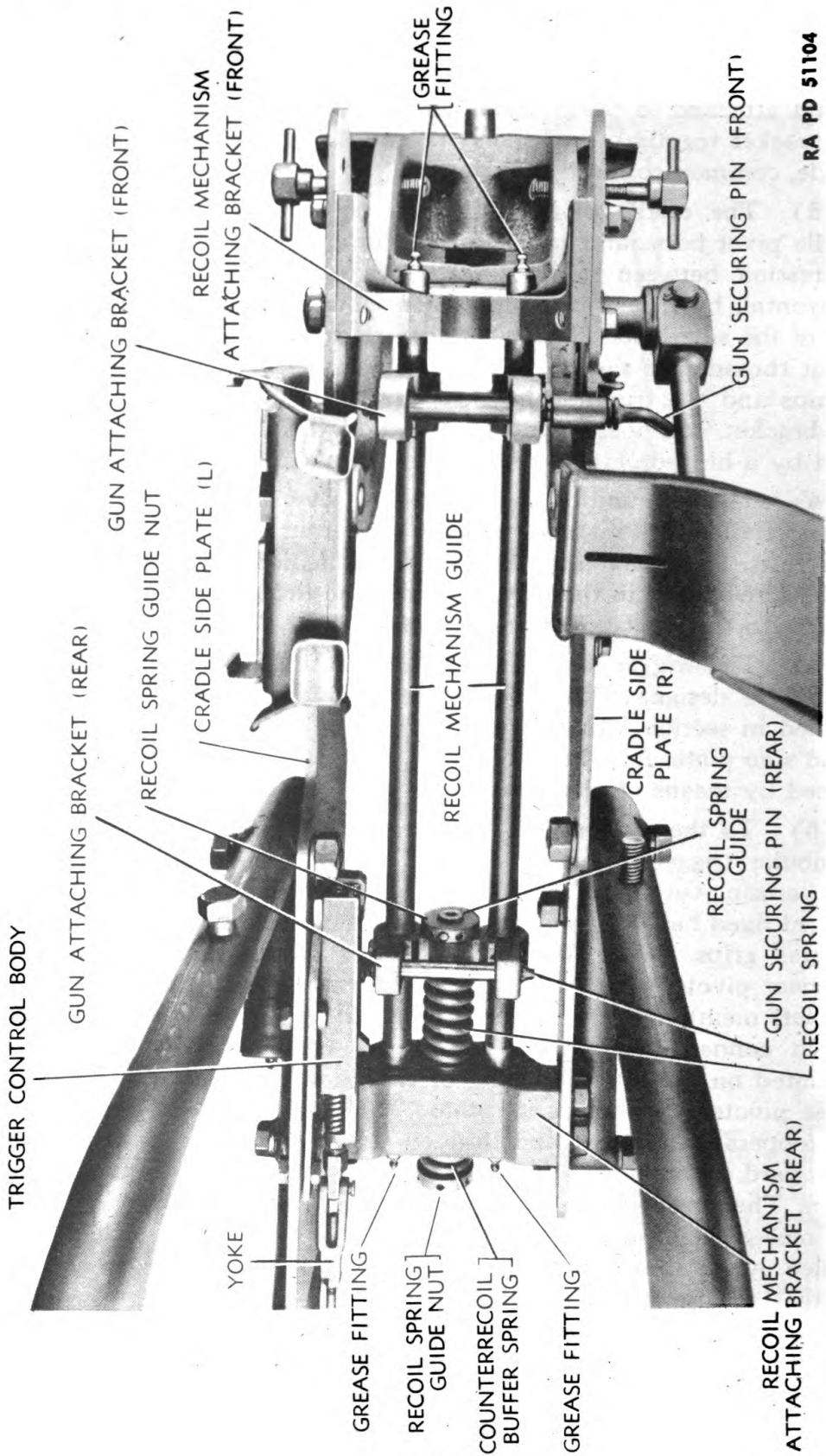
(4) The ammunition chest support is riveted to the left side plate of the cradle, and to it is secured the ammunition feed tray, by means of screws. This tray is adjustable for alinement by means of elongated screw holes in the tray. The metallic link chute is attached, by screws, to the right side plate of the cradle.

(5) The trigger control mechanism is identical in function, and similar in design, to that used on the M2 and M2A1 Mounts described in section VII, and is attached to the inner face of the left-hand side plate. Adjustment, in positioning of the mechanism, is furnished by means of elongated screw holes in the housing.

(6) To the rear end of the side plates of the cradle is attached a tubular trigger frame to which is assembled the trigger operating mechanism. On the right member of the frame are three equally spaced fixed hand grips. On the left member are three corresponding pivoted grips. These three pivoted grips are connected to a radial segment pivoted to a lever, which in turn is pivoted to a bracket on the left member of the trigger frame. To this lever a rod is pivoted which connects with the slide of the trigger control mechanism mounted on the left side plate of the cradle. When any one of the three pivoted hand grips is rotated, the radial segment is moved so as to operate the lever, and through it moves the trigger control rod backward or forward to operate the slide in the trigger control mechanism. The lever can be locked and thus prevented from operating by means of a spring-operated (plunger) lock. This lock can be pulled out of the lever bracket and hung in the disengaged position so that the lever can operate freely. When the lock is released, it springs forward to block the lever. This arrangement acts as a safety lock for the trigger control mechanism.

(7) To the outer side of the left side plate, the side plate trigger container is affixed. This container is similar to that furnished with

BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 51104

Figure 116 — Cradle Group, Showing Recoil Mechanism — Top View — A.A. Machine Gun Mount, Cal. .50, M3

### A.A. MACHINE GUN MOUNT, CAL. .50, M3

the M2 and M2A1 Mounts (par. 72 e (5) ), and contains the side plate trigger when not assembled to the gun. The front and rear gun securing pins are attached to the side plates of the cradle by chains. The pins secure the gun in the cradle when assembled. A shoulder on the pins seats behind the heads of screws in the mount when locked, and the pins are so constructed that they cannot be inserted or withdrawn, except when the handle is pointing directly upward and perpendicular to the cradle. Thus, the pins cannot shake out during firing of the gun.

#### e. Recoil Mechanism (fig. 116).

(1) The recoil mechanism is composed of two parallel guides which pass through the front and rear recoil mechanism attaching brackets in the cradle. These brackets act as bearings, and are lubricated by means of lubrication (grease) fittings in the ends of the guides which are drilled to allow grease to enter the bearings. Two cross brackets, to which the gun is mounted, are keyed to the guides. These gun attaching brackets are fixed with respect to the guides, and are furnished with drilled lugs. These lugs are spaced to correspond to the mounting lug and trunnion pinhole of the gun. When the gun is seated in the cradle, and the gun securing pins passed through gun and lugs on the gun attaching brackets, the gun is locked to the recoil mechanism guide assembly, or "slide" so formed, which moves with it during recoil and counterrecoil when firing.

(2) A spring guide provided with an integral collar, extends through the rear gun attaching bracket and the rear recoil mechanism attaching bracket, so that the collar bears on the front face of the latter bracket when assembled. A coiled recoil spring is assembled on the guide between the two brackets, bears on the collar of the guide, and takes the recoil force of the gun when firing and returns it to battery. A similar coiled counterrecoil buffer spring is assembled to the rear end of the guide, and bears upon the rear face of the front web of the recoil mechanism attaching bracket. This spring takes the counterrecoil force of the gun when returning to battery, and thus acts as a buffer. The springs are retained on the guide and adjusted for tension by a circular nut threaded to each end of the guide. These nuts are turned by inserting a spanner wrench or small rod in a cylindrical recess in the nut, and locked in position by means of two set screws in each nut. The tension of these two springs will determine the position of the recoil mechanism guide assembly, and thus the gun when mounted in the cradle, within narrow limits, and also the travel of the gun in the mount. When mounted, the gun must be so positioned that the side plate trigger lies in the proper relation to the slide in the trigger control mechanism on the cradle. A slight adjustment of the trigger control mechanism housing is provided for by elongated screw holes in the housing. Proper position-

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ing and adjustment of recoil and trigger control mechanism is covered in paragraph 82 c.

**f. Trigger Control Mechanism.** The functioning of the trigger control mechanism is identical with that described for the M2 and M2A1 Mounts in paragraph 73 d (figs. 89 and 97). The construction of the mechanism, however, is slightly different. The main differences are as follows:

(1) The slide cap is spot-welded to the slide, instead of being attached by a screw.

(2) The shoulder in the housing body, against which the trigger control mechanism spring and spring guide bear, is a separate T-shaped piece inserted in the body, and held in position by two screws. When disassembling, the trigger control mechanism spring must be sprung off the lug on the cap, before the buffer spring and guide rod can be disassembled from the slide.

(3) The trigger lever takes the place of the crank, and is attached to the trigger frame instead of to the slide housing body (figs. 114 and 115). The trigger rod extends straight to the rear from the slide to the trigger lever.

**g.** Details of construction and assembly are shown in SNL A-37.

**h. Sights** (fig. 117).

(1) The front and rear sights are of the ring type fastened to a support which is clamped to the water jacket of the gun by means of metal straps and toggle bolts. The sight assembly is positioned by the front sight of the gun which seats in an aperture in the sight base when assembled.

(2) Certain Browning Machine Guns, cal. .50, M2, Water-cooled, were manufactured with an alternate design of the front end cap which does not permit the attachment of sight assembly D82368 on the gun when the gun is mounted on the Antiaircraft Machine Gun Mount, cal. .50, M3. These guns have the following serial numbers:

346272 to 349454 inclusive

74739 to 74741 “

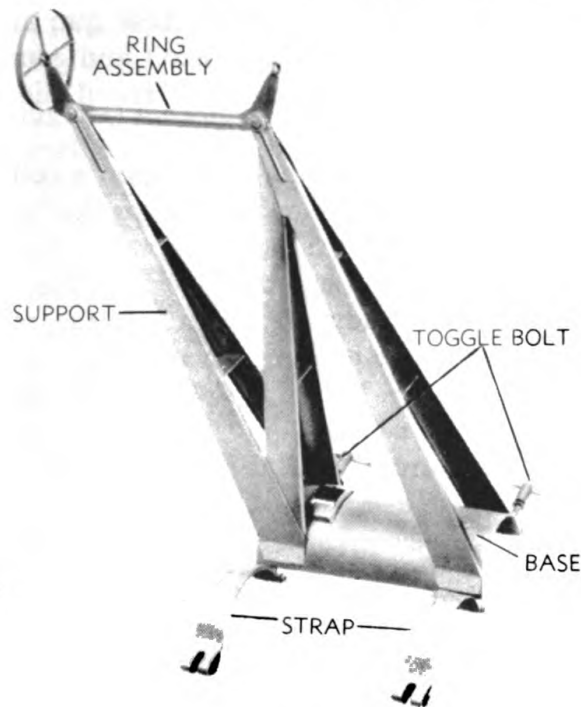
569309 to 569328 “

102124

(3) A new sight assembly D84680, which can be attached to guns with all types of front end caps, including those listed above, is being produced. The hole, through which the front sight of the machine gun protrudes, has been made nearer the front of the sight, thus allowing the straps to fasten farther back on the water jacket of the machine gun.

(4) A sufficient number of new sight assemblies D84680, for the guns with the alternate front end cap D282259B, are now available. Requisition should be made directly on Rock Island Arsenal.

**A.A. MACHINE GUN MOUNT, CAL. .50, M3**



RA PD 79920

**Figure 117 — A.A. Sight Assembly — Left Side View — A.A. Machine Gun Mount, Cal. .50, M3**

**80. FUNCTIONING.**

**a. Purpose of Mount.**

(1) The purpose of the mount is to provide a solid foundation for the gun, so that the muzzle can be swung quickly up or down, and right or left to cover a moving target. The horizontal movement is obtained through the rotation of the trunnion bracket socket on the pedestal body, and the vertical movement by the pivoting of the cradle on the cradle pivot bolts located in the horns of the trunnion bracket.

(2) The cradle, and hence the gun, can be locked at any elevation between minus 15 degrees and plus 90 degrees from horizontal, by means of the cradle clamps as already explained in paragraph 79 d (3). The socket can be clamped at any point on an arc of 360 degrees, by raising the clamping handle located on the pedestal, to lock the trunnion bracket socket in position.

**b. Recoil and Counterrecoil (fig. 116).**

(1) The gun is fastened to the recoil mechanism assembly guides in the cradle, through the medium of the front and rear gun attaching brackets keyed to the guides. These guides pass through the front and rear recoil mechanism attaching brackets secured in the cradle. For convenience, this group will be referred to as the "recoil slide" in this explanation of functioning. A spring guide passes through the rear re-

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coil mechanism attaching bracket and the rear gun attaching bracket on the "recoil slide." On this guide, the recoil and counterrecoil buffer springs are assembled, and the springs and "recoil slide" held together by a nut on each end of the spring guide.

(2) The (forward) *recoil spring* bears upon a collar on the spring guide, and the rear face of the rear bracket on the "recoil slide." The collar on the spring guide, in turn, bears upon the forward face of the recoil mechanism attaching bracket secured to the cradle. Thus, as the gun and "recoil slide" move rearward on the recoil movement, when the gun is fired, the recoil spring is compressed between the collar on the spring guide and the "recoil slide" bracket. Resistance to this compression brings the recoil slide and gun to rest, and the following expansion force of the spring forces them forward to the battery position.

(3) The (rear) *counterrecoil buffer spring* bears upon the rear face of the front web of the rear recoil mechanism attaching bracket secured to the cradle, and the nut on the rear end of the spring guide. Thus, when the gun and "recoil slide" move to the rear on the recoil movement, this spring is not affected, as the spring guide is anchored by its integral collar bearing on the recoil mechanism attaching bracket. As the gun and "recoil slide" move forward propelled by the force of the compressed recoil spring, the counterrecoil buffer spring is compressed (at the end of the movement) between the rear face of the front web of the recoil mechanism attaching bracket and the rear nut on the spring guide. The resistance of this spring to compression retards the forward movement of the "recoil slide" and gun, and finally brings them to rest.

(4) When firing automatically, the trigger control mechanism on the mount is so set with relation to the side plate trigger on the gun, that the gun is fired and starts to the rear in the recoil movement just before it reaches the limit of counterrecoil. When single shots are fired, or on the last shot of a burst, the gun is brought to rest by the counter-recoil spring.

(5) There is no compensating mechanism in this mount as in the M2 and M2A1 Mounts. The strong resistance of the recoil spring makes such compensation unnecessary. The functioning of the trigger control mechanism, with respect to the side plate trigger in the gun, is the same as for the M2 and M2A1 Mounts, and is explained in detail in paragraph 73 e. Functioning of these two mechanisms is the same, with the exception that the slide of the trigger control mechanism of the M3 Mount is retracted to fire the gun by turning forward one of the control grips on the trigger frame instead of depressing the hand lever, as in the case of the M2 and M2A1 Mounts. The grip is locked in the nonfiring position by means of the trigger lock as already explained in paragraph 79 d.

**A.A. MACHINE GUN MOUNT, CAL. .50, M3****81. DISMOUNTING AND MOUNTING THE GUN AND MOUNT GROUPS (fig. 118).**

**a.** Dismounting and mounting the gun, and the groups which comprise the mount, include the removal of the gun from the mount, and the reinstallation therein. Mounting and dismounting also include the removal and reinstallation of the main groups of parts and assemblies which comprise the mount assembly, for convenience in cleaning and transportation. Should further disassembly be required, it should be referred to a qualified ordnance unit in order that qualified personnel with proper tools may be furnished, or directions transmitted. In dismounting, it is assumed that the gun and mount are set up ready for action.

**b. Dismounting.****(1) PRELIMINARY.**

**(a)** Lock the cradle at "O" elevation, lock the trunnion bracket to the pedestal by means of the clamping handles, and then, fully unload the gun.

**(b)** Remove the water hoses from the water jacket of the gun by unscrewing the connection nuts, and screw on the union caps. If the gun is to be disassembled or transported, the water jacket should be drained by opening the drain valve, with one or both of the union caps removed.

**(c)** Remove the ammunition chest from the cradle.

**(d)** Disengage the clamping straps of the sight assembly by unscrewing the toggle bolt nuts, and swinging bolts out of engagement with the straps. Then, lift the sight from the water jacket of the gun, and refasten the straps.

**(2) GUN.**

**(a)** Loosen the left-hand nut on the lower shield plate, and swing the shield up to allow clearance for the gun when removing. It is even better to remove the shield entirely to guard against its falling, and possibly causing injury.

**(b)** Remove the upper shield assembly by unscrewing the clamping bolts, and lifting from the trunnion bracket.

**(c)** Rotate the handles of the gun securing pins until they point upward, perpendicular to the cradle, and are disengaged from the retaining screws, and then, pull out the pins.

**(d)** Lift the gun horizontally upward until clear of the gun securing brackets, and then, move it forward out of the cradle. Observe care that the side plate trigger does not strike the mount as damage to the trigger may result. Reinstall and lock the gun securing pins.

**(e)** Secure the lower shield plate firmly to the trigger frame after the gun is removed.



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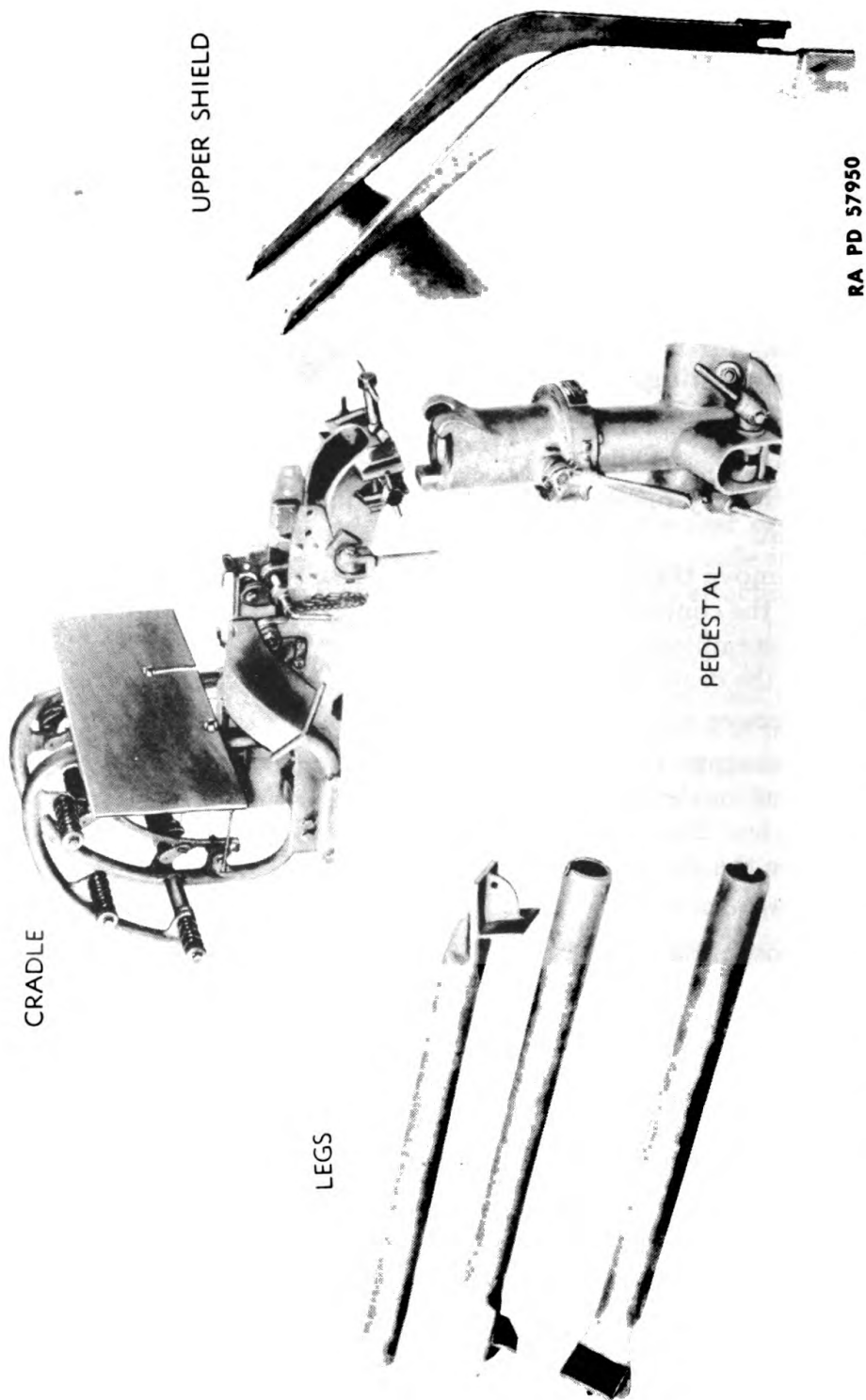


Figure 118 — Mount Groups Dismounted — A.A. Machine Gun Mount, Cal. .50, M3

**A.A. MACHINE GUN MOUNT, CAL. .50, M3****(3) CRADLE AND TRUNNION BRACKET.**

(a) Unscrew the trunnion bracket clamping bolt located in the front face of the trunnion bracket until disengaged from the retaining recess in the trunnion bracket socket head.

(b) Tip the cradle slightly forward; then lift it upward and to the rear, and remove it from the pedestal.

(4) **TRIPOD LEGS.** Unscrew the leg clamping bolts part way by turning the handles, and then tip the tripod up and remove one leg by pulling out of the housing. The tripod can then be laid flat, and the other two legs removed in a similar manner.

**c. Mounting.****(1) TRIPOD LEGS.**

(a) Unscrew the leg clamping bolt part way to separate the clamping jaws, and insert the slotted end of the leg into the leg housing on the bottom of the pedestal, so that the slot in the leg mates with the pin in the top of the housing.

(b) Push leg fully home in the housing and tighten clamping jaws, by turning the handle, to secure the leg. The legs can be assembled with pedestal lying flat, or two legs assembled, and the pedestal then tipped up while the third leg is assembled. (Tighten leg clamps after a few bursts have been fired.)

**(2) CRADLE AND TRUNNION BRACKET.**

(a) Unscrew the trunnion bracket clamping bolt in the front face of the trunnion bracket (fig. 112), part way, so that its nose will clear the rear face of the lug on the trunnion bracket socket head when assembling (fig. 118).

(b) Clamp the socket to the pedestal, and then clamp the cradle to the trunnion bracket by means of the clamping handles, so that the cradle is roughly parallel with the lower seating face of the trunnion bracket.

(c) Lift the cradle and seat the trunnion bracket in the seating recess in the socket head so that the lip on the bracket will slide under the lips on the socket head. Tip the cradle back until seated level and screw in the trunnion bracket clamping bolt tightly. Rock the cradle slightly and continue to tighten the bolt until there is no movement between trunnion bracket and socket head.

(3) **GUN.** Remove the gun securing pins by turning handles up and pulling out, and lift or remove the rear shield plate as explained in dismounting. Then, with the cradle clamped securely at "O" elevation, lift the gun horizontally and seat it in the cradle so that the gun securing pinholes in the gun and gun securing brackets aline. Then, insert the pins, handle up, push home, and turn the handles down to

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

lock in position. Be careful not to strike the side plate trigger on the cradle when assembling, as the trigger may be damaged. Secure the lower shield plate in position.

**CAUTION:** Be sure the shoulder on the gun securing pins is behind the heads of the gun pin locking screws before turning the handles down.

**(4) REMAINING ASSEMBLY.**

**(a)** Mount the upper shield assembly to the trunnion bracket by sliding the slotted ends of the supports into the recesses in the sides of the trunnion bracket, and then clamping in place by means of the clamp bolts.

**(b)** Clamp the sight onto the muzzle end of the water jacket, so that the aperture in the body of the sight fits over the front sight on the water jacket, and the sight supports slope forward with the large ring in the front. Then swing the clamping straps up around the jacket, and clamp securely in place by means of the toggle bolt nuts. (For alternate sight, refer to paragraph 79 h.)

**(c)** Mount the ammunition chest securely to the ammunition chest support on the left-hand side plate of the cradle, check alinement of the ammunition feed tray with the feedway in the gun, and adjust if necessary.

**(d)** Fill the water jacket and water chest if empty, and connect the water hoses of the chest to the jacket by screwing the couplings on the bushings. Be sure the drain valve is securely closed before filling the jacket.

**(e)** The gun is now ready to load and operate. Before loading, be sure the trigger mechanism control and hand trigger are placed at "SAFE."

**82. ADJUSTMENTS.**

**a.** The recoil mechanism and trigger control mechanism are adjusted at manufacture, and should not be disassembled or disturbed except by qualified ordnance personnel, when necessary. However, as slight variations may occur in the setting of these mechanisms, which are important to the proper functioning of the gun, their positioning is explained below so that possible malfunction of the mount may be recognized.

**b. Recoil Mechanism (fig. 116).**

**(1)** The position of the gun is fixed with respect to the recoil assembly, as the gun securing brackets on the guides are pinned in position at manufacture and cannot shift. The position of the gun and recoil assembly with relation to the trigger control mechanism on the mount, however, is obtained, within narrow limits, by the assembly of

**A.A. MACHINE GUN MOUNT, CAL. .50, M3**

the recoil and counterrecoil springs in the recoil mechanism. As already explained in description of the mount, these springs are mounted on a spring guide which extends through the rear recoil mechanism securing bracket and the rear gun securing bracket, and are held in place by nuts threaded to the spring guide. The recoil spring bears between a collar on the guide, which in turn bears upon the forward face of the rear recoil mechanism securing bracket, and the front nut. The counterrecoil buffer spring bears between the rear face of the front web of the rear recoil mechanism attaching bracket and the rear nut. Thus, when the front nut is adjusted, it affects the tension of the recoil spring and the longitudinal position of the slide, and consequently the gun. When the rear nut is adjusted, it affects the tension of the counterrecoil buffer spring only, as the collar on the guide is held against the rear recoil mechanism attaching bracket by this spring. When these springs are properly adjusted, the gun should have a total travel of  $\frac{3}{8}$  inch in the mount, when firing.

(2) The proper relative positions of the operating lugs on the side plate trigger slide on the gun and the trigger control mechanism slide, are necessary to the proper functioning of the gun with respect to the mount when firing. The gun must be positioned in the mount, and the trigger control mechanism positioned on the mount, so that when at rest, the slide in the trigger control mechanism can fully retract the slide in the side plate trigger of the gun to fire the first shot, by turning forward the grips on the trigger frame. There must, however, be no overtravel of the trigger control mechanism slide; otherwise the parts will be strained when the gun fires automatically. However, there should be sufficient clearance to preclude premature firing of the gun when hand-operating. To prevent such premature firing, there should be a  $\frac{5}{16}$ -inch clearance between the perpendicular face of the operating lug on the side plate trigger slide and corresponding face of the operating lug on the trigger control mechanism slide when the gun is at rest and the trigger control grip in the released position. If, when the recoil mechanism and trigger control mechanism are properly adjusted to give this clearance, the trigger control mechanism slide cannot be retracted sufficiently to fire the gun, the trigger control rod should be adjusted in the yoke to give sufficient throw when the grip is turned to the fire position, without changing the adjustment of the slide. A slight adjustment of the grip is made possible by serrations on the grip and pivot on the trigger frame.

(3) The above adjustments are accomplished by the proper assembly of the recoil and counterrecoil buffer springs in the recoil mechanism, and the positioning of the trigger control mechanism housing body on the side plate of the cradle. The recoil spring (front spring) is assembled with a load of 225 pounds plus or minus 5 percent which gives it an assembled height of 2.687 ( $2\frac{11}{16}$ ) inches. The counterrecoil

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

buffer spring (rear spring) is assembled with a load of 260 pounds plus or minus 5 percent which gives it an assembled height of 2.375 ( $2\frac{3}{8}$ ) inches. Approximately, these springs are properly assembled as to load and height, when the retaining nuts which hold them on the spring guide are screwed up until they are even with the large diameter of the bevels on the threaded ends of the guide. The free height of the recoil spring is 3.000 inches, and that of the counterrecoil buffer spring 2.687 ( $2\frac{11}{16}$ ) inches.

**c. Trigger Control Mechanism.**

(1) The trigger control mechanism is positioned on the side plate (figs. 108 and 116), so as to have the proper alinement with respect to the side plate trigger on the gun when mounted, with the recoil and counterrecoil buffer springs set, as in subparagraph **b** (3) above. A slight adjustment of the trigger control mechanism is provided for by the elongated screw holes in the housing. As already stated, this adjustment is made at manufacture, and should not be disturbed unless the clearance between the operating lugs on the slides of the side plate trigger and trigger control mechanism is found to be incorrect to the extent that it will cause a malfunction of the gun with respect to the mount. With recoil mechanism properly adjusted, as explained above, the gun and mount will function properly if the  $\frac{7}{16}$ -inch clearance between the operating lugs on trigger control mechanism and side plate trigger is maintained as explained in subparagraph **b** (2) above, and the total travel of the gun is  $\frac{3}{8}$  inch.

(2) Such adjustment can be made by loosening the attaching screws, and shifting the trigger control mechanism housing backward or forward. Any such adjustment, however, must be accompanied by a corresponding adjustment of the trigger control rod with respect to the slide. This adjustment is accomplished by disengaging the rod, and screwing it in or out of the yoke the same amount that the housing is shifted backward or forward, so as to maintain the proper throw. In case of such adjustment, care should be observed to see that screws, lock nuts, and cotter pins are securely fastened to preclude further shifting.

**83. CARE AND CLEANING.**

**a.** Care, cleaning, and lubrication of this mount is generally accomplished as for the M2 and M2A1 Mounts, and is covered in paragraphs 31 and 32.

## Section IX

### FIELD INSPECTION

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Operating inspection .....	85
Gun inspection .....	86
Mount inspection .....	87
Equipment inspection .....	88

#### 84. GENERAL.

a. Inspection of the gun, mounts, and accessories is vital. Thorough systematic inspection at regular intervals is the best insurance against an unexpected breakdown of the materiel at the critical moment when maximum performance is absolutely necessary. Never allow the materiel to deteriorate. Keep it in first class fighting condition by vigilant inspection and prompt maintenance.

b. Inspection is for the purpose of determining the condition of the materiel, whether repairs or adjustments are required, and the remedies necessary to insure serviceability and proper functioning. Its immediate aim is trouble prevention, which includes:

- (1) Preventive maintenance.
- (2) Discovering evidence of improper treatment received by materiel before delivery into the hands of using arm personnel.
- (3) Determining when replacement of parts is necessary because of ordinary wear, or defects in parts.

c. Inspection, as covered in this manual, is in the nature of an operating and functioning inspection of the gun, mounts, and accessories, with special attention to those parts and adjustments which lie within the scope of using arm personnel.

d. In order to inspect the materiel properly, personnel must have a thorough understanding of the assembly, operation, functioning, care, and adjustment as covered in previous sections in this manual. In short, one must know how the materiel should look and work before faults can be detected. Points to be observed during assembly, before, during, and after firing, and adjustments of headspace and recoil mechanisms have been already covered. Inspection, as covered herein, is in the form of a review to call attention to important points to be observed.

#### 85. OPERATING INSPECTION.

a. With the gun fully assembled and unloaded, pull back the retracting slide all the way, then, allow it to go forward and the recoiling parts to go into battery. Repeat this several times to test smoothness of action.

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b. Then, with the cover raised, pull back the retracting slide handle as far as it will go, allow it to go forward, and note whether the recoiling parts go *fully forward* into battery. In this position, the barrel extension should bear upon the trunnion block, and the bolt be fully locked to the barrel extension. If this is not the case, it is likely that the front or rear barrel packing is binding or headspace is insufficient.

**CAUTION:** When operating, keep fingers out of receiver opening to avoid injury.

c. Check the headspace by means of the headspace gage as prescribed in paragraph 46.

d. Move the belt feed lever in the cover from side to side to make sure that the slide has full free movement, and see that the feed lever plunger and bolt switch are properly positioned (pars. 50 and 56).

e. Close and latch the cover. Then retract the recoiling parts, as in subparagraph a above, and allow them to go forward. Press the hand trigger, to test the releasing of the firing pin. Repeat the operation, and test by pulling back the side plate trigger slide (if assembled) or press in the sear slide with a screwdriver to release the firing pin.

f. If dummy cartridges are available, load the gun and operate with such cartridges to test extraction, loading, and ejection of the cartridges, and functioning of the belt feed mechanism.

g. Fill the water jacket if empty, and check for cracks, and leaks in packing or drain valve.

h. See that gun is properly oiled and lubricated as prescribed in sections V and XIV.

**86. GUN INSPECTION.**

**a. General.**

(1) Remove the groups from the gun and inspect each group for security and condition of its components, deformation, burs, rust, dents, cracks, and like defects as prescribed below. Defective parts should be repaired if defects are minor, or replaced from the organizational spare parts, and parts so used requisitioned, in order to keep the organizational spare parts set complete at all times.

(2) Burs or rough surfaces may be smoothed *to a polish only* with CLOTH, crocus, or a fine grained sharpening stone. The notches in the sear, firing pin extension, and sear slide should be stoned, when necessary, only by qualified ordnance personnel. Stoning should be carefully done, in order to preserve the slope of the face stoned, and as little metal as possible removed. Repaired or replaced parts should be tested for proper functioning, after assembly.

(3) See that the accelerator locks the barrel extension positively to the oil buffer, the bolt moves freely in the barrel extension, and

## FIELD INSPECTION

the breech lock functions smoothly in both barrel extension and bolt to lock them together.

### **h. Casing Group.**

(1) See that the water jacket is tight on the trunnion block, in proper alinement, and the trunnion lock fully engaged, and examine jacket for leaks, cracks, and dents.

(2) Remove the thread cover, see that the packing gland is in position, and the bearing lock and jam nut are tight.

(3) Check drain valve for operation and positive closing.

(4) Check front sight group for security on water jacket.

(5) Check free movement of steam tube (early design) by tipping the casing, and check front support lock screw for tightness. The steam tube should slide freely upon its supports when the water jacket is tipped.

(6) Check belt holding pawl on left side of trunnion block (left-hand feed) for free spring movement on the belt holding pawl pin and for foreign matter under the pawl. See that spring (or springs) is seated properly both in pawl and bracket, and that holding pin spring is in position in end of the pin.

(7) See that front cartridge stop and right-hand rear cartridge stop assembly are secured to right side of trunnion block (left-hand feed) by belt holding pawl pin, and pin spring in position. Check spring functioning of cartridge alining pawl in stop, and pawl for wear and burs. If separate rear cartridge stop and link stripper are used, see that they do not bind (par. 58 h (1) ).

(8) See that switch moves freely and snaps back into position without unnecessary binding or side play. See that end of spring is seated in hole in casing, and cotter pin clinched around nut.

(9) See that extractor cam is tightly riveted to the left side plate and is not burred, and that there are no loose rivets in receiver plates.

(10) Check side plates for deformation, and cracks at the back plate grooves.

(11) Check security of retracting slide group on receiver and see that locking wires are in position, properly clinched, and not broken or cracked, and that screws do not protrude into receiver. Check action of lever and grip for binding or unnecessary looseness, and parts of group for looseness.

(12) Check bolt stud and slot in side plate for excessive wear which might cause the stud to bind in the slot or leave it, and check collar on stud for excessive width which may cause binding.

(13) Check side plate trigger for security on receiver, and proper functioning, and condition of cotter pin in nut. If trigger does not



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work smoothly, remove, disassemble, and examine spring. If spring is damaged, replace it. Free length of spring is  $\frac{1}{4}$  inch.

(14) See that top plate bracket is securely riveted in place, and slots free from burs. Check trigger bar for deformation and burs, and trigger bar pin for security and locking in detent in side plate of receiver. If pin is loose, replace it with new assembly.

(15) See that cover detent functions properly, spring is not broken, and cotter pin in good condition and properly spread. Free length of spring is  $2\frac{1}{32}$  inch plus or minus  $\frac{1}{32}$  inch.

(16) See that cover closes and latches properly, and is not bent, twisted, or loose.

(17) See that combination rear sight on gun (if assembled) functions properly, fixed base is tight on top plate, and stud is not loose.

(18) See that breech lock cam is secured in place with a slight lateral float, that bolt is properly secured by nut and cotter pin, and cam is not excessively worn or burred. (Cam should not be loose.)

(19) See that the trigger bar does not drag on the bolt when the hand trigger is depressed (par. 67 h (9) ).

**c. Cover Group.**

(1) Check cover extractor cam for loose rivets, wear, and burs; cover extractor spring for position, cracks, and tension (should be stiff); and cover latch spring for positioning on stud and in retention slot, and for cracks.

(2) Check belt feed lever for deformation and worn or burred cam lug, and spring plunger for spring action and positioning (upper hole for left-hand feeding with cover upright).

(3) Test belt feed slide for free movement in guideways; it should not bind. Belt feed lever plunger spring should return slide to within cover when released.

(4) Test spring action of belt feed pawl and see that spring is seated in pawl and slide, and that there is no foreign matter or grease under pawl.

(5) See that belt feed pawl arm is not bent or burred, that pawl pin is flush with both faces of the slide, and spring is in pin.

**d. Back Plate Group.**

(1) See that back plate slides into receiver properly, guides are not burred or broken, and latch and latch lock function properly.

(2) See that all pins are properly secured, trigger safety is secure and screws staked, trigger is not bent or burred, and trigger spring is in position.

(3) See that buffer plate protrudes properly from face of back plate (approx.  $\frac{3}{16}$  inch), and that adjusting screw is tight with plunger

## FIELD INSPECTION

and spring in place. Screw should not protrude less than  $\frac{1}{16}$  inch (1 thread) when screwed in tight (par. 48 a (8) ). When gun is first inspected, the number (22) and proper seating of buffer disks should be checked, and tube cleaned, if necessary.

### e. Oil Buffer Group.

(1) See that oil buffer body is properly retained in the receiver, and spring lock is staked securely in the body and has sufficient spring to properly seat in side plate locking recess.

(2) Check tube lock for retention, position and seating in body, proper engagement with serrations in tube, point of lock for wear and burs, and for foreign matter between lock and body. Forward end of lock should bear upon the accelerator, and seat snugly in the notch in lower face when rotated fully to rear. If the accelerator is not so held, it may rotate forward sufficiently for the tips to jam in the breech lock recess in the bolt when the bolt moves forward. If the lock is too short or the end sprung up insufficiently, it will not hold the accelerator properly. The lock should have free spring movement and not bind with the sides of its seating groove in the oil buffer housing.

(3) Check guide lug on side of body for wear, and burs, key slot for wear and burs, and movement of oil buffer spring guide key in slot when assembled.

(4) Check breech lock depressors for loose rivets, deformation, wear, and burs. Rivets should be tight.

(5) Check accelerator for chipping, wear, and burs, pin for security, and see that spring in pin is properly seated and functioning.

(6) Check oil buffer tube for rust, dents, and cap, relief valve and filler screws for looseness and leaking. See that tube is *full* of proper recoil oil (par. 36).

(7) Check piston for deformation, wear, and burs. Inspect buffer spring for cracks or rust, and key on guide for looseness, wear, and burs. Free length of oil buffer spring is 6 inches plus or minus  $\frac{1}{4}$  inch. The buffer should not be disassembled except for repair.

(8) Check the over-all length of the buffer group with the spring assembled, from the rear face of the buffer tube to the extreme end of the piston rod. This dimension should be between 6.525 and 6.553 inches. If shorter, the gun will malfunction when elevated, and should be turned over to a responsible ordnance unit for adjustment or replacement of buffer group. This fault will cause the gun to fire a few rounds, and then stop, when elevated, and can be detected by removing the driving spring and raising the cover. Then, elevate the gun to 90 degrees and notice if there is a gap between the barrel extension and the trunnion block. There should be no gap between

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these components. (Headspace should be checked before testing as above.)

**f. Driving Spring Rod Group.**

(1) See that rod is not bent and that both inner and outer spring are in position and free from fracture, binding, grease, rust, and foreign matter. Free length of inner and outer driving spring is 22 inches plus or minus 1 inch.

(2) See that collar is securely pinned in place on the rod, and end of stop pin is upset for retention.

(3) See that retaining pin is secured in rod head, free from wear and burs, and not bent.

**g. Bolt Group.**

(1) Inspect bolt for rust, wear, and burs, and recesses for foreign matter, grease or excess oil. Recesses should be clean, especially the tunnels for the firing pin and driving spring rod groups.

(2) Check sear, firing pin extension, and sear slide for proper functioning retention and releasing, and sear spring and retainer for seating, deformation, or fracture. There should be no binding. Free length of sear spring is  $\frac{9}{16}$  inch plus or minus  $\frac{1}{32}$  inch. These parts should be free from rust and burs, and notches clean and sharp.

(3) Check firing pin lever for deformation, wear, and burs. Small end should be straight, and cam surface on lower rear end smooth and not worn.

(4) Check firing pin extension for deformation and burs, spring recess for foreign matter, grease, and oil, and firing pin for deformation or worn or burred nose. There should be no grease or oil present, and firing pin nose should be free from burs or excessive wear. Firing pin spring stop pin should be flush with faces of the extension. Protrusion of firing pin from face of bolt when fully forward should be not less than  $\frac{1}{16}$  inch. Lightly dented primers usually denote a short firing pin or fouling or grease in the firing pin tunnel in bolt. Pierced primers denote excessive protrusion of the firing pin due to worn pinhole in face of bolt. In case of enlarged firing pin refer to ordinance. Firing pin and extension should have free movement in the bolt without binding. Free length of firing pin spring is  $3\frac{7}{32}$  inches plus or minus  $\frac{1}{16}$  inch.

(5) Inspect feed lever cam grooves in top of bolt and switch for burs, and check proper assembly and retention of switch and seating of stud. Check extractor for proper retention in bolt, bent or burred shank or claw, and loose bent or burred ejector. (Narrow side of switch should face to the rear for left-hand feeding.)

(6) See that head of cocking lever pin is free from burs and seats flush with the grooves in the side of the bolt, and head is on the *left* side of bolt.

## FIELD INSPECTION

(7) See that extractor stop pin is secure and not worn or burred.

### h. Barrel Extension.

(1) See that side members of extension are not sprung or cracked, that shank is secure and neither bent nor burred, and lock pin flush with side faces of extension. Check breech lock aperture and pin slots for wear and burs.

(2) See that breech lock works smoothly but is neither loose nor binding, seats fully in bolt, with double bevel up and forward when assembled, and is free from burs and rust. Check breech lock pin for wear at point where depressors contact, and see that spring is in position in pin.

(3) See that barrel locking spring is held securely, has sufficient spring to engage notches in barrel, and that nose is neither worn nor burred.

### i. Barrel.

(1) Inspect barrel for deformation, rust, loose sleeve or locking spring ring, damaged packing, or loose adjusting ring. See that notches are clean and free from burs or excessive wear. Notches should be deep and sharp enough to positively retain nose of locking spring. Barrel should screw easily into barrel extension but have no shake. The rear end of the barrel should project slightly into the barrel extension when screwed all the way in, otherwise a true head-space adjustment cannot be made.

(2) Clean bore thoroughly and inspect with bore reflector, or if disassembled from the gun, by holding up to the light. See that chamber and bore are free from rust and metal fouling which will be evident by dark patches, or streaks, and that lands and grooves are sharp, clean, and free from large pits (the width of a land and  $\frac{1}{2}$  to  $\frac{3}{4}$  inch in length). Check for cracks, bulges, and wear of bore at muzzle. Bulges will be evident by shadowy rings in the bore, or raised rings on the exterior of the barrel. If any of the above defects are evident, replace the barrel, and refer the damaged barrel to ordnance for checking.

## 87. MOUNT INSPECTION.

a. Inspect mounts as a whole for condition, rust, and chipped paint, see that they are properly assembled and firmly positioned, and that all nuts and screws are tight. Elevate and traverse the cradle to see that movement is free, and check pintle (M2 and M2A1 Mounts) for corrosion. See that cradle clamp, pintle lock (M2 and M2A1 Mounts), and socket clamp (brake assembly, M3 Mount) function properly and lock securely.

b. See that ammunition chest holder, metallic link chute, and feed tray are secure and aligned. See that sight support (M2 Mount)

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is secure on the cradle, sights secure on the support, and rear sight bracket, body, and open front sight locked in place. See that flexible cables are properly mated and secured to elevating and traversing screws, function freely, are securely clamped to the sight support, and that the covers are in place on the shaft housings, unless sighting equipment is attached.

c. See that antiaircraft sight (M2A1 and M3 Mounts) is securely fastened to the water jacket of the gun and so assembled that the large ring is at the front. See that the sight is not bent.

d. Check trigger control mechanisms for security on cradle, proper alinement, position of control lever (M2 and M2A1 Mounts), control grip linkage (M3 Mount), and proper spacing with regard to the slide. Check action of control in the neutral, locked, and firing position with respect to the side plate trigger on the gun, and see that parts operate smoothly and freely.

e. See that recoil mechanisms are secure in the cradle, adjustments are correct, and locking nuts and like parts are secure. Be sure recoil spring guide nut screws are set tight to lock the nuts on the guide (M3 Mount).

f. Check racks and gears (M2 and M2A1 Mounts) to be sure spotting marks on gears are correctly alined when the cradle is at "0" elevation, and that racks are not bent. Check gear and rack teeth for burs, wear, and foreign matter, and transfer gears for excessive lateral play.

g. Be sure side plate trigger is in its container on the mount or assembled to the gun.

h. See that slide stop functions properly with the slide (M2 and M2A1 Mounts), and has sufficient spring action to release it when the gun is fired.

i. See that tripod legs are securely clamped to the pedestal, and that spades on leg ends are not broken, loose, or bent. If pedestal base is assembled, see that the pedestal is drawn down tight and evenly and jam nuts on eyebolts are tight (M2 and M2A1 Mounts). See that base is bolted securely to its foundation with pad in place.

j. See that the slides, and other reciprocating parts are lubricated as explained in paragraph 32.

k. See that gun is properly secured (when mounted) with cradle clamp secure and joint pin fully seated with spring in pin (M2 and M2A1 Mounts), and gun securing pins (M3 Mount) are locked with handles turned down.

l. See that mounts are properly oiled and lubricated as prescribed in paragraphs 31 and 32.

**FIELD INSPECTION****88. EQUIPMENT INSPECTION.****a. Water Chests, Cal. .50, M2 and M3.**

(1) Inspect water chest generally for condition, leaks, chipped paint, inside and out, rust, and corrosion. Check inside of chest for sediment and foreign matter, and pump group for free movement and fouling. Description and operation of the chest, and removal and reinstallation of pump group is contained in section XIII.

(2) Fill the chest with water, turn the crank to rotate the pump, and check freedom of movement and positive flow of water from the outlet connection. See that pump group is evenly and securely fastened to the chest, and that there is no unnecessary play or looseness in the crank or driving parts. See that the sprockets of the (M3 Chest) pump are in alinement and properly secured to their shafts, the chain is not loose enough to jump the sprockets, and that the connecting link is secure. See that sprocket teeth (M3 Chest) and gear teeth (M2 Chest) are free from burs and not excessively worn, and the blades in the rotor (M3 Chest) move freely.

(3) Check the condition of the packing of the filler cap, union nipples, and pump shaft. The pump shaft packing is adjusted by means of the packing gland nut, and should not bind the shaft when adjusted.

(4) See that the union nipple caps are secured to the chest, and the threads of nipples and caps are free from burs and excessive wear.

(5) Check the water hoses for cracks, porousness, and splits, especially under the hose clamps, see that hose clamps are tight and not cracked, and that clamp screw threads are not stripped or rusted.

(6) Check threads of union nuts for burs and excessive wear, and see that they mate properly with the threaded bushings on the water jacket of the gun.

**b. Ammunition Chest, Cal. .50, M2.**

(1) Inspect the ammunition chest generally for condition, chipped paint, rust, dents, and condition of lining (old style). Description and operation of the chest is contained in section XIII.

(2) Check the movement and tension of the spindle as described in section XIII, and position and function of the reel. The reel should be centrally located between the sides of the chest.

(3) See that the rollers move freely and the shaft nuts are properly staked, and that cartridge filler piece set screw is secure, and piece in proper position.

(4) See that chest and mechanism is clean and free of grit or foreign matter, that the hinge is not loose, and that cover latches securely.

(5) Check the edges of the mounting slots for burs and wear.

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**c. Link Loading Machine, Cal. .50, M2.**

(1) Inspect machine generally for condition, rust, bent or dented parts, and for burs, especially in the cartridge grooves of the base and the cartridge link stop.

(2) Operate the handle to see that the slide moves freely and fully in both directions.

(3) See that all cotter pins and screws are in position and secure, and that the cartridge link stop is securely and evenly attached to the base.

(4) Check spring action and security of loading slide stop. Also check for wear and burs.

**d. Control Equipment Set M1.** See that Control Equipment Set M1 is in good condition and functioning, as described in section **X**. Check flexible shafts for kinks, dents in casing, and protrusion of core from casing due to stretching. Check threads of all unions for burs and excessive wear.

**e. Spare Parts and Accessories.** See that sets of spare parts, tools and accessories as listed in SNL A-37, are complete and in good condition at all times. Refer to section **XIII** for description of these items.

Section X

**ANTIAIRCRAFT AUTOMATIC GUN CONTROL  
EQUIPMENT SET M1**

Paragraph

Control equipment set, automatic gun, antiaircraft, M1..... 89

**89. CONTROL EQUIPMENT SET, AUTOMATIC GUN, ANTI-AIRCRAFT, M1.**

a. **General.** One Automatic Gun Antiaircraft Control Equipment Set M1 (figs. 119, 120, and 121) is furnished for each firing unit of four Browning Machine Guns, cal. .50, M2, Water-cooled when used with the A.A. Machine Gun Mount, cal. .50, M2, section VII. The set complete consists of the control box, twenty 50-foot flexible shafts including two spares, and the necessary packing chests for control box and flexible shafts.

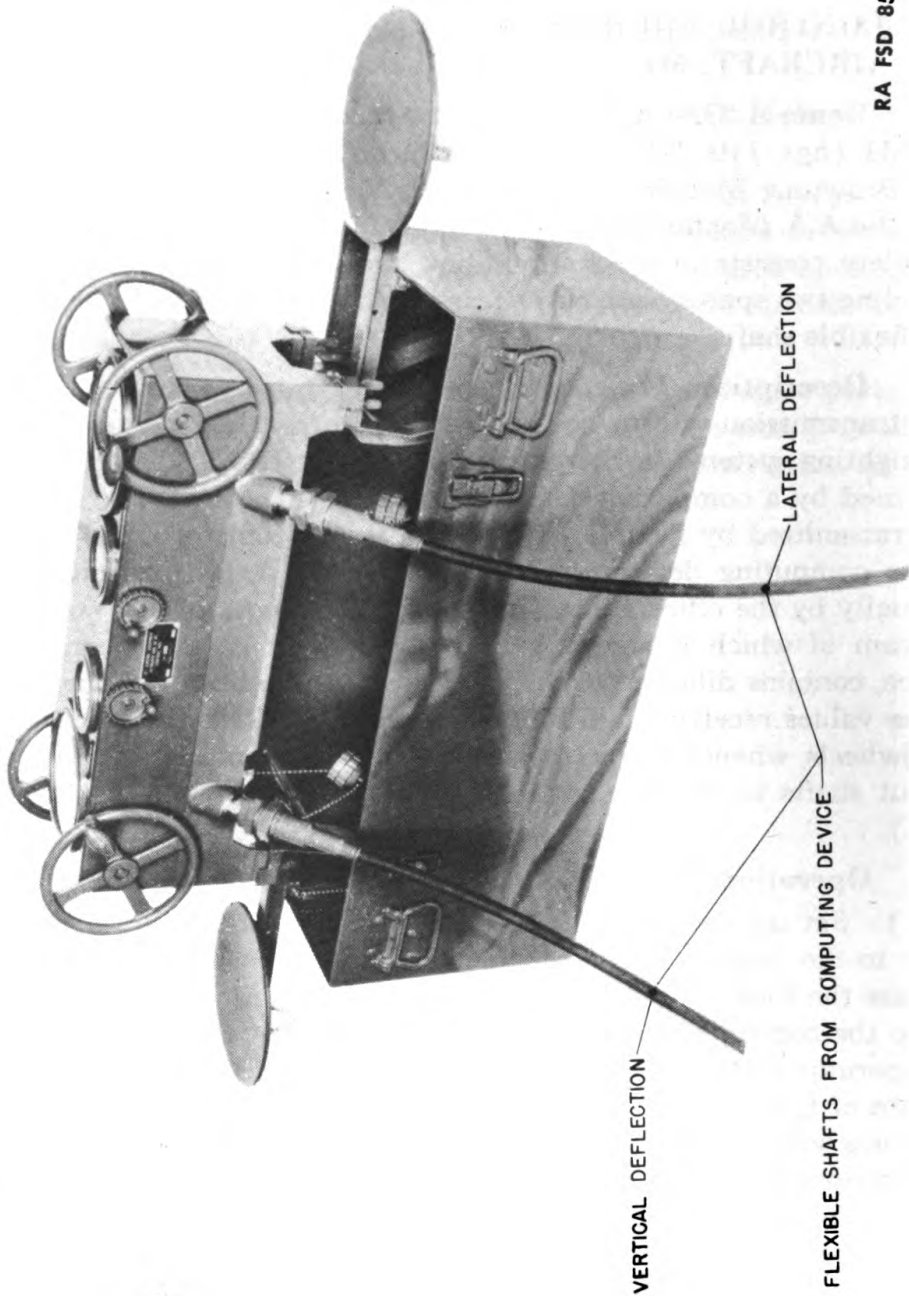
b. **Description.** The control equipment set is a manually operated data transmission system, used to transmit corrected deflection data to the sighting systems of the guns. Vertical and lateral deflections, determined by a computing device if available (not a part of the set), are transmitted by flexible input shafts to the control box of the set. If the computing device is not available, the deflections are set in manually by the officers directing the fire. This control box (top view diagram of which is shown in fig. 121) which is not a computing device, contains differential drives whereby corrections may be added to the values received, and follow-the-pointer mechanisms, driven by handwheels, whence the corrected data are transmitted by the flexible output shafts to the gun sight adjusting mechanisms on the mounts (M2).

c. **Operation.**

(1) Set up the control box. Carry the control box in its packing chest to the desired location, which should be on firm level ground. Release the four trunk bolts, and remove the lid of the packing chest. Grasp the control box by the base, and lift it from the chest. Remove the operator seat locking pins holding the folding seat supports to the bottom of the chest. Unfold the seats upward and outward, until the seats are substantially level and the holes in the projecting legs of the horizontal seat supporting bars are alined with the holes in the blocks at the ends of the packing chest. Insert the operator seat locking pins in the holes. Slide the seats outward to the desired location; the removable support arm locking pins being provided under each seat to permit this adjustment. Place the control box on the blocks ahead of the seats, and screw the wing screws upward securely into the threaded holes in the base of the box. The appearance of the control box and

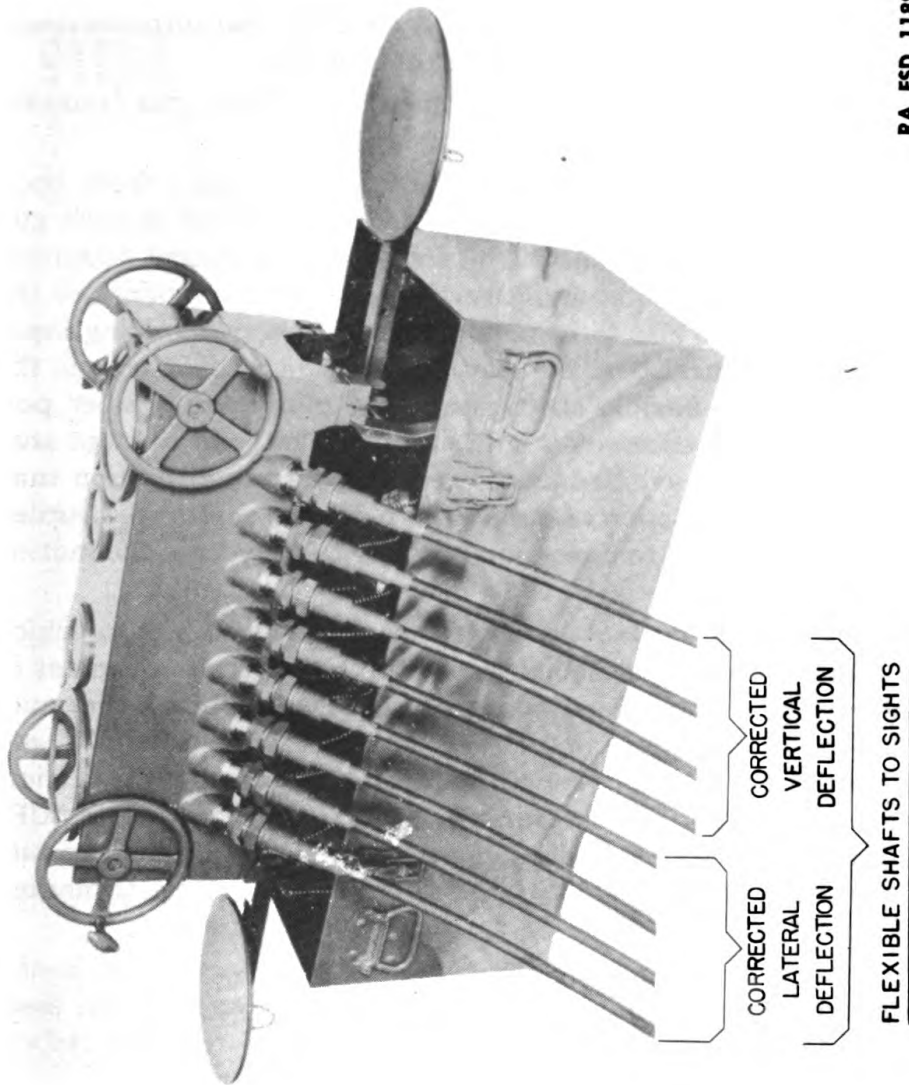


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**Figure 119 — Automatic Gun Antiaircraft Control Equipment Set, M1, Input Side**

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Figure 120 — Automatic Gun Antiaircraft Control Equipment Set, M1, Output Side

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packing chest, when ready to operate, is as shown in figures 119 and 120.

(2) Set the control box indexes to "Normal", the position shown in figure 121, if they are not already in that position. First turn the deflection correction knobs until their respective indexes indicate zero, then turn the handwheels until the outer indexes indicate 300 (normal). If each inner index does not then match the outer index, unscrew the cover over the associated input coupling and turn the coupling as required to bring the indexes into coincidence.

(3) Set the computing device and the sight on each gun (mount) to "normal."

(4) Remove the required number of flexible shafts from their packing chests. The lateral and vertical deflection drives of each gun sight require connection to one of the corresponding output couplings of the control box. The lateral and vertical deflection couplings of the computing device are also to be connected to the corresponding input couplings of the control box. For runs longer than 50 feet, couple the required number of flexible shafts, using the minimum number possible. To take up any excessive shaft length, lay the shaft in large arcs. Sharp bends must be avoided as the resulting increased friction may cause incorrect transmission of data. Where flexible shafts are coupled together, or are coupled to a receptacle, screw the covers of the mating parts together to protect the threads.

**NOTE:** The four *output* couplings on the control box to which flexible shafts should be attached to operate the lateral movement of the sight mechanism on the gun mounts, are located opposite the small index dial for lateral deflection marked with the words "RIGHT" and "LEFT" on the dial. The four couplings for shafts to operate the vertical movement of the sight mechanism are opposite the dial marked "UP" and "DOWN". The corresponding *input* couplings are on the opposite side of the box. There are identification plates on some chests marked "VERTICAL" and "LATERAL" to identify the couplings.

(5) After the system has been completely connected, set in any required corrections to lateral and vertical deflections, using the associated knobs, and operate the handwheels so as to match their respective outer indexes continuously with the inner indexes.

(6) It is also possible to set corrected deflections, when known, on the control box directly, the values transmitted being those indicated by the outer index on the associated scale. The position of the inner index and the correction settings are then disregarded.

(7) To prepare the set for traveling, remove the flexible shafts from their receptacles and replace all covers. Wipe all dirt and water from the control box. Slide the seats to their innermost position. Place the seats and control box in the packing chest, following in reverse

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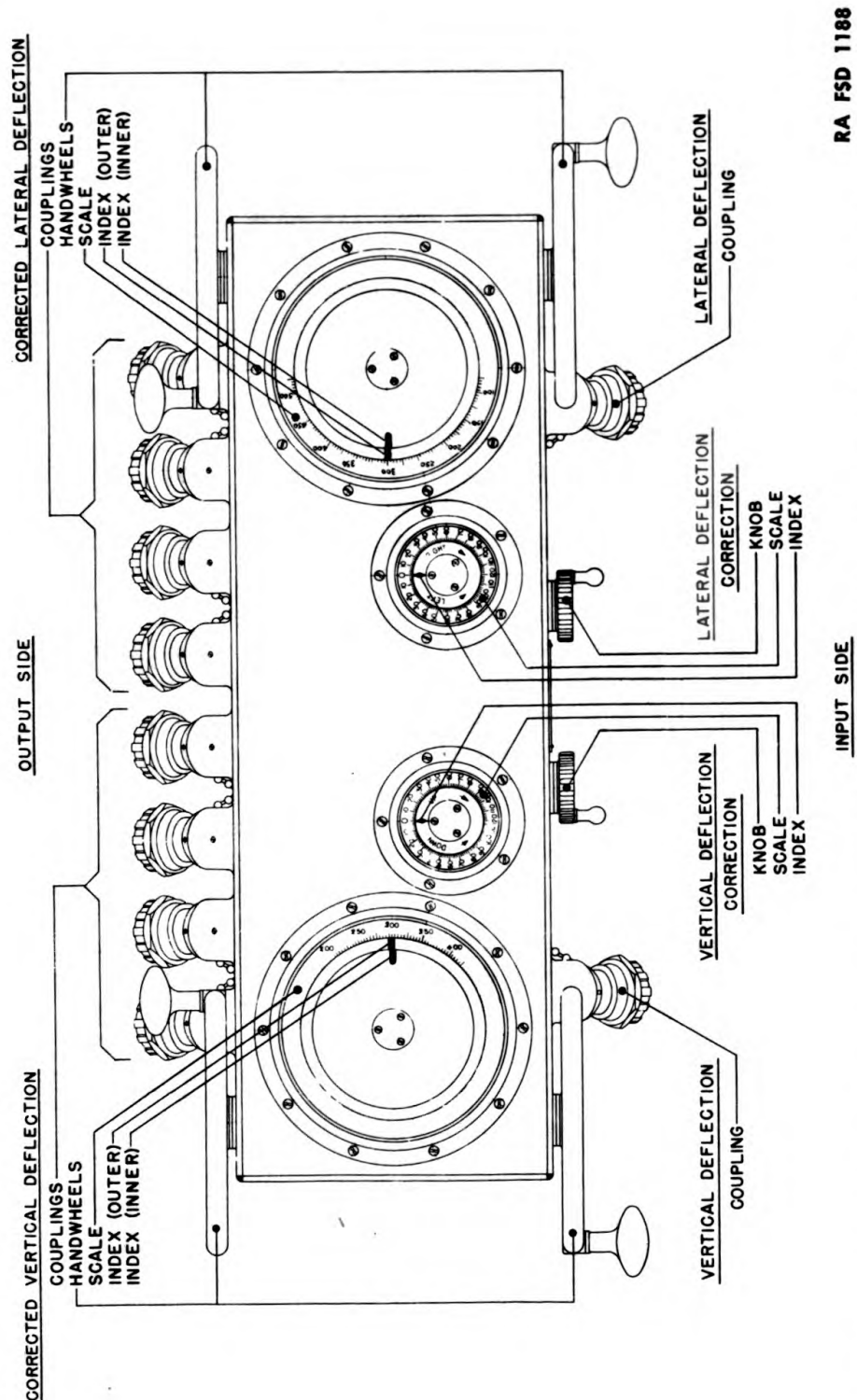


Figure 121 — Top View Diagram of Control Box, Automatic Gun Antiaircraft Control Equipment Set, M1

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order the procedure given for setting up the control box. Grasp the control box by the base when lifting. Wipe off any water and dirt from the flexible shafts, and roll them up to the proper radius for packing in the chests. Each packing chest accommodates four flexible shafts.

**d. Care and Preservation.**

(1) Do not kink the flexible shafts, nor bend them at a short radius. Exercise care to prevent their being chafed, rubbed, or crushed.

(2) Keep the flexible shaft casing free from oil.

(3) Weekly, or more frequently if conditions warrant, clean the couplings and lightly oil with OIL, lubricating, for aircraft instruments and machine guns. Keep the covers in place when not in use.

(4) Ball bearings and gears are lubricated at assembly. Lubrication of these parts is required only at long intervals, and is to be performed by ordnance personnel, using GREASE, lubricating, special.

(5) Access by the using arms to the internal parts of the control box or flexible shafts for lubrication or other purposes is not permitted. Adjustment of stops by the using arms is not permitted.

(6) When placing a new control box in service, be certain that the box is arranged for use with cal. .50 machine guns. Note the graduations on the corrected deflection scales which should range from 75 to 525 for lateral deflection and from 200 to 425 for vertical deflection. Note also the location of the stops. They should function close to the maximum and minimum scale graduations.

(7) Do not connect up a flexible shaft until the elements connected have been set to "NORMAL." Also, do not interconnect couplings not carrying the same element of data.

(8) The control box should not be lifted by the handwheels.

## Section XI

# AMMUNITION

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## 90. GENERAL.

a. The information in this section pertaining to the several types of cartridges authorized for use in the Browning Machine Gun, cal. .50, M2, Water-cooled, includes a description of the cartridges, means of identification, care, use, and ballistic data.

## 91. NOMENCLATURE.

a. Standard nomenclature of ammunition items is used herein in all references to specific items. Its use for all purposes of record is mandatory.

## 92. CLASSIFICATION.

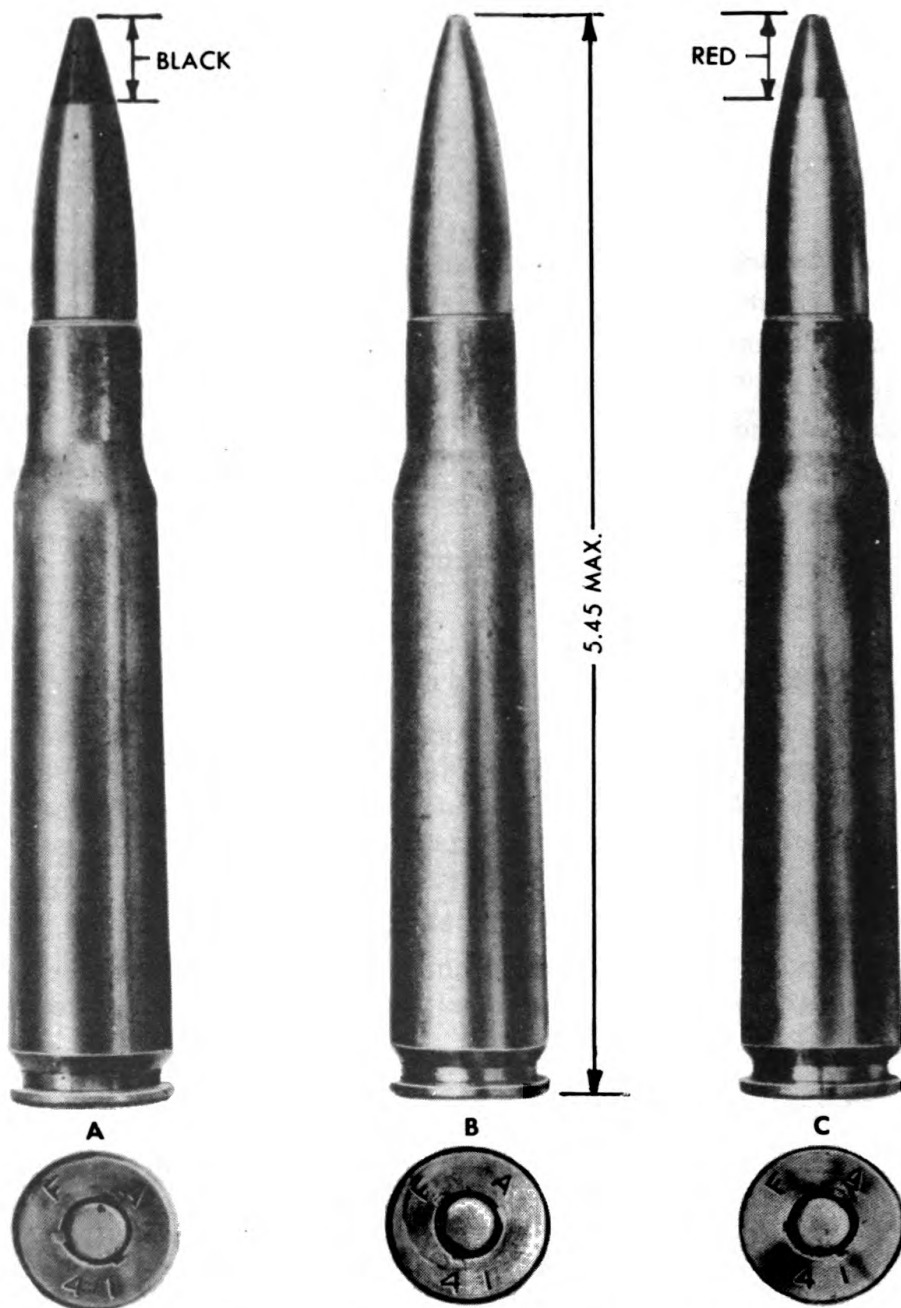
a. Based upon use, the principal classifications of ammunition for this machine gun are:

- (1) Ball, for use against personnel and light materiel targets.
- (2) Armor-piercing, for use against armored vehicles, concrete shelters, and similar bullet-resisting targets.
- (3) Incendiary, for incendiary purposes.
- (4) Tracer, for observation of fire and incendiary purposes.

b. Other types provided for special purposes are:

- (1) Blank, for simulated fire, signaling, and salutes.
- (2) Dummy, for training (cartridges are inert).

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

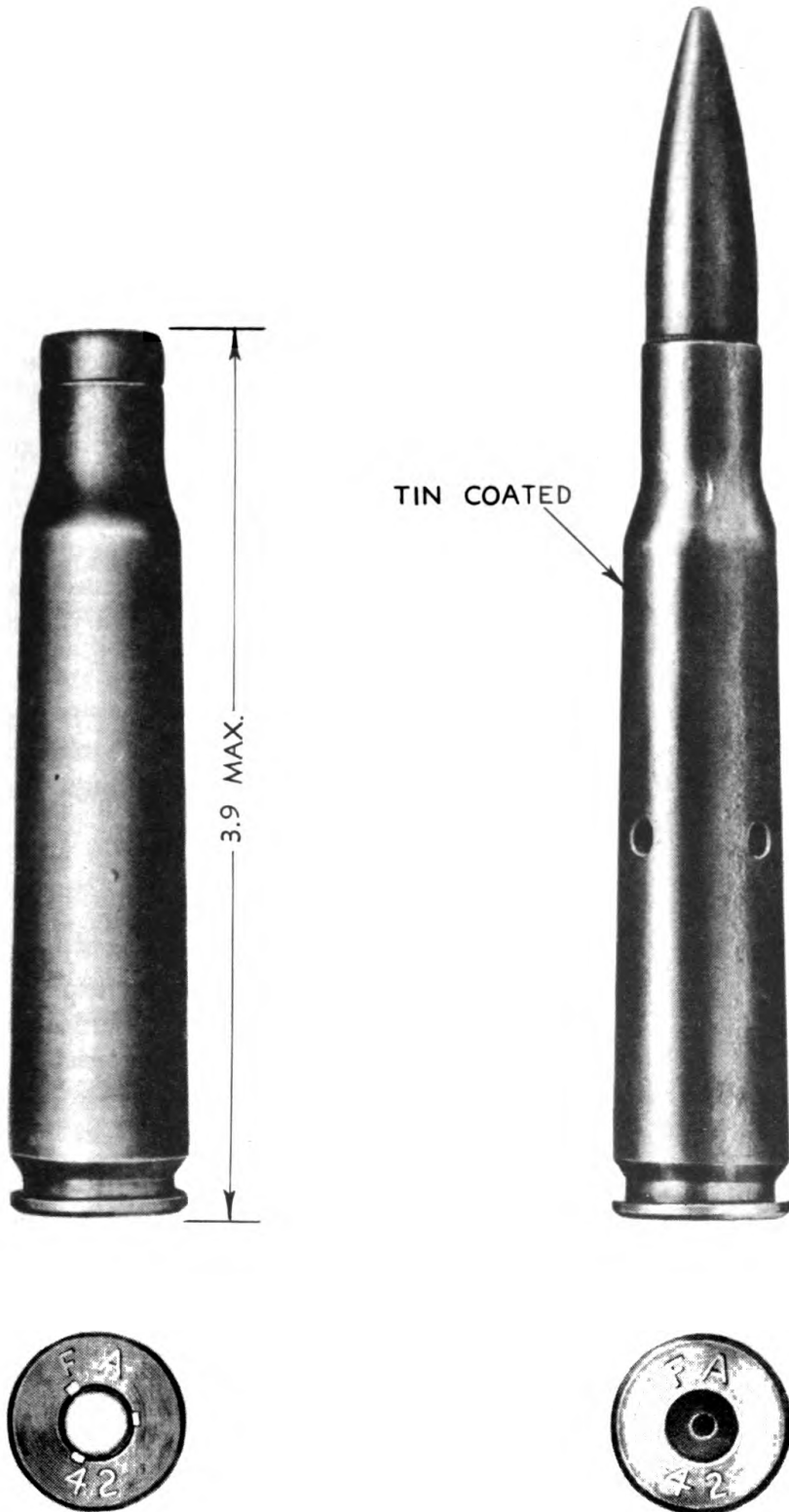


- A—CARTRIDGE, ARMOR-PIERCING CAL. .50, M2  
B—CARTRIDGE, BALL, CAL. .50, M2  
C—CARTRIDGE, TRACER, CAL. .50, M1

RA PD 2117

**Figure 122 — Cartridges, Cal. .50**

AMMUNITION



RA PD 49603

*Figure 123 — Cartridges, Cal. .50, Blank and Dummy*



**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS****93. IDENTIFICATION.**

**a. General.** Even though the cal. .50 cartridges are not marked or stamped to indicate the type or model, each type may be identified as described below. In general, the only stamping on the cartridge is that of the manufacturer's initials and the year of loading which appear on the base of the cartridge case. However, the marking on all original packing containers, both boxes and cartons, clearly and fully identifies the ammunition except as to grade (subpar. f below). In addition to the marking, stenciled figure symbols on the ammunition boxes indicate the type of packing. Color bands were formerly painted on boxes and printed on carton labels to provide a ready means of identification as to type.

**b. Types.** When removed from their original packing containers, the cartridges may be identified, except as to ammunition lot number and grade, by physical characteristics as described below and illustrated in figures 122 and 123. Care should be taken not to confuse these original markings with any subsequent markings made with lithographic marking ink, which is used to identify lots during target practice (subpar. h below).

Type	Distinguishing Characteristics
Ball .....	Copper-colored gilding metal jacket on bullet (see note below). No markings.
Armor-piercing .....	Tip of bullet painted black.
Incendiary .....	Tip of bullet painted blue.
Tracer .....	Tip of bullet painted red.
Blank .....	No bullet is present.
Dummy .....	Tinned cartridge case. No primer is present in base of cartridge case. Three holes are drilled in the body of the case.

**NOTE:** Cartridges of new manufacture may have steel bullet jackets.

**c. Model.** To identify a particular design, a model designation is assigned at the time it is classified as an adopted type. The model designation becomes an essential part of the standard nomenclature of the item and one of the means of identification. The present system of model designation is the use of letter "M" followed by an Arabic numeral. For example, CARTRIDGE, ball, cal. .50, M2.

**d. Ammunition Lot Number.** When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. This lot number or the repacked lot number (subpar. e below) is marked on all packing containers. It is required for all purposes of record, including grading and use, reports on condition, functioning,

## AMMUNITION

and accidents in which the ammunition might be involved. No lot other than that of current grade appropriate for the weapon will be fired (subpar. e below). Since it is impractical to mark the ammunition lot number on each individual cartridge, every effort should be made to maintain the ammunition lot number of cartridges that are removed from their original packings. Cartridges, for which the ammunition lot number has been lost, are placed in grade 3 (unserviceable ammunition, which will not be issued or fired). Therefore, when cartridges are removed from their original packings, they should be marked or tagged so that the ammunition lot number may be preserved.

**e. Repacked Lot Number.** Repacked lot numbers are assigned to cartridges packed in rifle clips, web belts, and metallic link belts. These repacked lot numbers are stenciled on the side and one end of each packing box. The ammunition lot number of the cartridges comprising a repacked lot are listed on a reference card placed inside the packing box.

**f. Grades.** Small arms ammunition is graded primarily on the qualities which make the lot especially suited for use in a particular class of small arms weapons. For example, a lot of ammunition assigned grade AC is especially suited for use in aircraft weapons. Current grades of all existing lots of small arms ammunition are established by the Chief of Ordnance, and are published in Ordnance Field Service Bulletin No. 3-5. Only those lots of appropriate grade will be fired. Grade 3 indicates unserviceable ammunition which will not be issued or fired.

**g. Marking.** In addition to markings on packing boxes required for shipping purposes, the following are also stenciled or marked on the boxes (fig. 124):

(1) Repacked lot numbers appear in place of the ammunition lot number on packing boxes or crates containing ammunition packed in clips, linked belts, or web belts. The repacked lot number consists of the words "REPACKED LOT"; the initials of the repacker; the letter "C," "B," or "L," for clipped, belted, or linked cartridges, respectively; and the lot number assigned by the repacker.

(2) Markings stenciled on the box indicate the type or types, and ratio of the cartridges within the box, for example, "4 BALL M2, 1 TR M1".

(3) Stenciled figure symbols on the sides and ends of packing boxes containing cartridges in clips, web belts, and linked belts indicate the type of inner packing. For example, for cartridges packed in metallic link belts, the symbol indicated in figure 124 is used. The absence of stenciled figure symbols indicates that the ammunition is packed in cartons.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

(4) Code symbols (Ammunition Identification Code), as published in SNL T-1 and OFSB 3-14, are also stenciled on packing boxes. These code symbols indicate a specific cartridge, or combination of cartridges, having a specific grade and packing. For the published and authorized code symbols, see SNL T-1 and OFSB 3-14.

**h. Lithographic Marking Ink.** The number of hits, made upon a target by a certain machine gun or group of machine guns when others are firing upon the same target, is sometimes determined by coating the tips of the bullets with lithographic ink. The bullets from each weapon or group of weapons are coated with a distinctive color of ink, which upon striking the target, leaves a smear indicating the source of fire. For method of application, see TM 9-855. Cartridges, which have been so coated, must have the ink removed before return to storage.

**94. PACKING.**

**a.** Recent lots of cal. .50 service cartridges are packed as indicated below. The data indicated may vary dependent upon the particular lot. For additional packing data see SNL T-1 and SNL T-5. See figures 124 and 125.

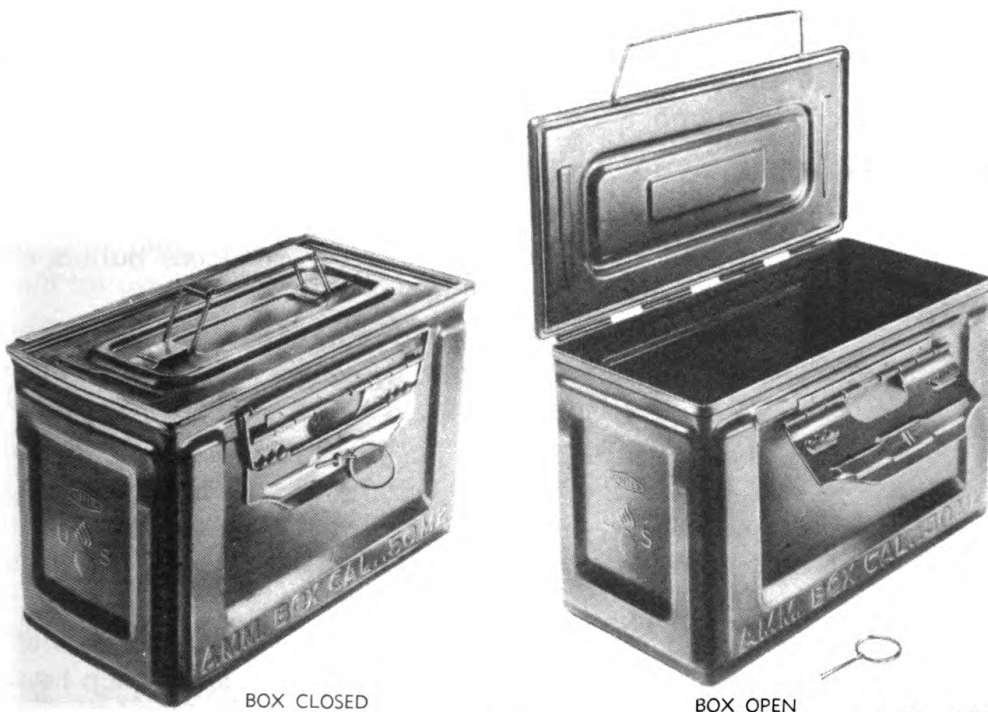
<i>Packing</i>	<i>Cubic feet</i>	<i>Weight in pounds</i>
Packed 110 cartridges in machine gun fabric belt or 100 cartridges in metallic link belt, 1 belt per metal box, 2 boxes (220 or 200 cartridges) per wire bound crate. ....	0.93	71.
Dimensions of crate: $14\frac{5}{8}$ x $13\frac{1}{8}$ x $8\frac{3}{8}$ inches		
Packed 265 rounds in metallic links in the M1917 metal-lined box. ....	1.49	100.
Dimensions of box: $18\frac{7}{16}$ x $14\frac{13}{16}$ x $9\frac{7}{16}$ inches		
Packed 10 cartridges per carton, 35 cartons (350 cartridges) per M1917 metal-lined box. ....	1.49	112.
Dimensions of box: $18\frac{7}{16}$ x $14\frac{13}{16}$ x $9\frac{7}{16}$ inches		
Packed 10 cartridges per carton, 12 cartons per wax container, 2 containers (240 cartridges) per box. ....	1.12	79.
Dimensions of box: $15\frac{3}{16}$ x $13\frac{15}{16}$ x $9\frac{1}{8}$ inches		

AMMUNITION



RA PD 61215

Figure 124 — Packing Box for 265 Cartridges, Cal. .50, Linked



BOX CLOSED

BOX OPEN

RA PD 68351

Figure 125 — Ammunition Box, Cal. .50, M2  
(for 110 round machine gun belt)

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

**95. CARE, PRESERVATION, AND HANDLING.**

a. Small arms ammunition, as compared with other types of ammunition, is not dangerous to handle. Care, however, must be observed to keep the packing cases from becoming broken or damaged. All broken cases must be immediately repaired and careful attention given to the transfer of all markings to the new parts of the box. In case the box contains a metal liner, it should be air-tested and sealed, provided that equipment for this work is available.

b. Ammunition boxes should not be opened until the ammunition is required for use. Ammunition removed from its container, particularly in damp climates, may become corroded, thereby causing the ammunition to become unserviceable.

c. The ammunition should be protected from mud, sand, dirt, and water. If it gets wet or dirty, wipe it off at once. If verdigris or light corrosion forms on cartridges, it should be wiped off with a clean dry CLOTH, wiping. However, cartridges should not be polished to make them look better or brighter.

d. The use of oil or grease on cal. .50 cartridges is prohibited.

e. Ammunition should not be exposed to the direct rays of the sun for any length of time. Such exposure may affect seriously its firing qualities.

f. Whenever cartridges are taken from original packing containers, they will be tagged or otherwise marked so that the ammunition may be identified as to lot number. Such identification is necessary to prevent otherwise serviceable ammunition from being placed in grade 3, through loss of lot number.

**96. PRECAUTIONS IN FIRING.**

a. Ammunition which is seriously corroded should not be fired.

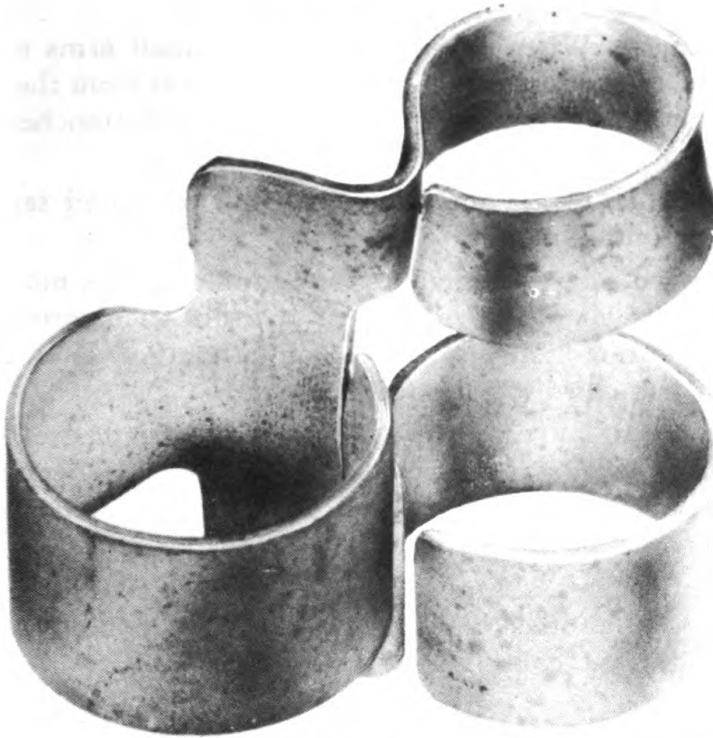
b. Do not fire dented cartridges, cartridges with loose bullets, or otherwise defective rounds.

c. No cal. .50 ammunition will be fired until it has been positively identified by ammunition lot number and grade, as published in the latest revision or change to Ordnance Field Service Bulletin No. 3-5.

d. Before firing, the firer should be sure that the bore of the weapon is free of any foreign matter, such as gun-cleaning patches, oil, grease, mud, sand, snow, and the like. To fire a weapon with any obstruction in the bore may cause the gun to burst and result in injury to personnel.

e. Do not fire oiled or greased cartridges without first removing the oil or grease with a dry, clean wiping cloth nor those which have become overheated due to exposure to the direct rays of the sun or other sources of high temperature. Such cartridges, if fired, may develop hazardous chamber pressures.

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RA PD 61183

*Figure 126 — Metallic Belt Link, Cal. .50, M2*

### 97. PRECAUTIONS AND MISFIRES IN FIRING BLANK AMMUNITION.

#### a. Precautions.

(1) It is dangerous to fire machine guns loaded with blank cartridges at personnel representing an enemy at distances of less than 20 yards, as the wad or paper cup may fail to break up.

(2) Only blank ammunition closed with a thin paper cup or wad will be used in the machine gun.

b. **Misfires.** Misfires in which the primer explodes but fails to ignite the powder charge may prove dangerous when blank ammunition is being fired. In misfire of this kind some of the powder may be blown into the bore of the weapon. A series of such rounds in which the powder fails to ignite due to moisture or other causes will result in an accumulation of powder sufficient to cause serious damage when ignited by a normal cartridge. When misfires are encountered in blank ammunition in excess of 5 percent, the firing of the lot will be suspended, and the matter reported to the Chief of Ordnance.

### 98. STORAGE.

a. Whenever practicable, small arms ammunition should be stored under cover. This applies particularly to tracer ammunition, which

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS

is subject to rapid deterioration if it becomes damp, and may even ignite spontaneously. When necessary to leave small arms ammunition in the open, raise it on dunnage at least 6 inches from the ground and cover it with a double thickness of paulin. Suitable trenches should be dug to prevent water from flowing under the pile.

b. If practicable, tracer ammunition should be stored separately from other ammunition.

c. **Fire Hazard.** In a fire, small arms ammunition does not explode violently. There are small individual explosions of each cartridge, the case flying in one direction and the bullet in another. It is unlikely that the bullets and cases will fly over 200 yards.

d. Small arms ammunition in storage should be protected from extreme heat in order to avoid decomposition of the propellant powder. The combination of high temperatures and a damp atmosphere is particularly detrimental to the stability of the powder.

e. When only a part of a box is used, the remaining ammunition in the box should be protected against unauthorized handling and use by firmly fastening the cover in place.

### 99. AUTHORIZED ROUNDS.

a. The following ammunition of appropriate grade (par. 93) is authorized for use in Browning Machine Gun, cal. .50, M2, Water-cooled. It will be noted that the nomenclature (standard nomenclature) completely identifies the cartridge as to type, caliber, and model (figs. 122, 123, 126, 127 and 128).

CARTRIDGE, armor-piercing, cal. .50, M2

CARTRIDGE, ball, cal. .50, M2

CARTRIDGE, blank, cal. .50, M1

CARTRIDGE, dummy, cal. .50, M1

CARTRIDGE, dummy, cal. .50, M2

CARTRIDGE, incendiary, cal. .50, M1

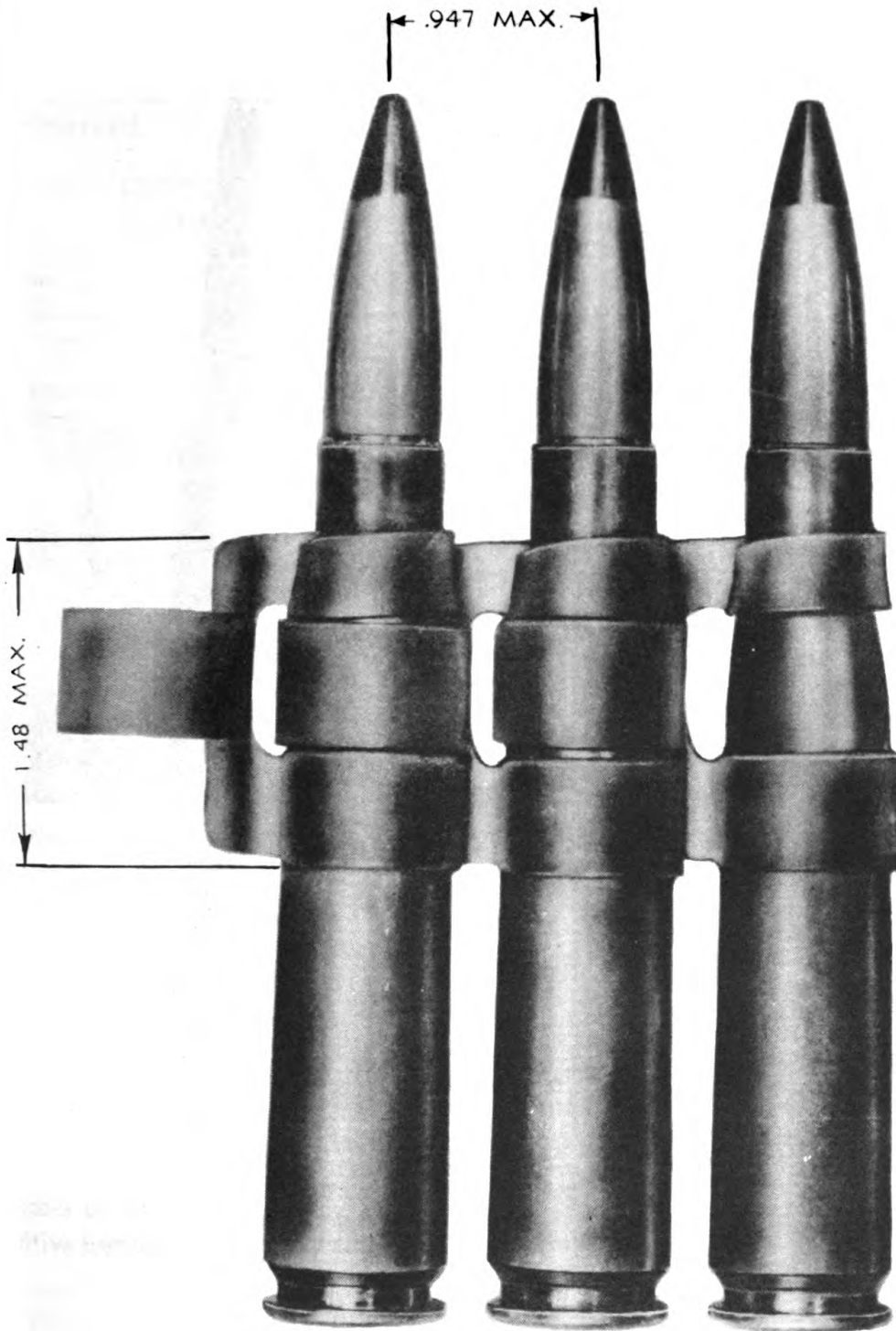
CARTRIDGE, tracer, cal. .50, M1

### 100. BALLISTIC DATA.

a. The maximum ranges and muzzle velocities of the service types of cal. .50 ammunition authorized for use in this machine gun are given below.

Type and model of cal. .50 cartridges	Muzzle velocity (feet per second)	Approx. maximum range (yards)
CARTRIDGE, armor-piercing, cal. .50, M2	2,935	7,600
CARTRIDGE, ball, cal. .50, M2.....	2,935	7,600
CARTRIDGE, incendiary, cal. .50, M1.....	3,100	7,600
CARTRIDGE, tracer, cal. .50, M1.....	2,865	7,200

AMMUNITION

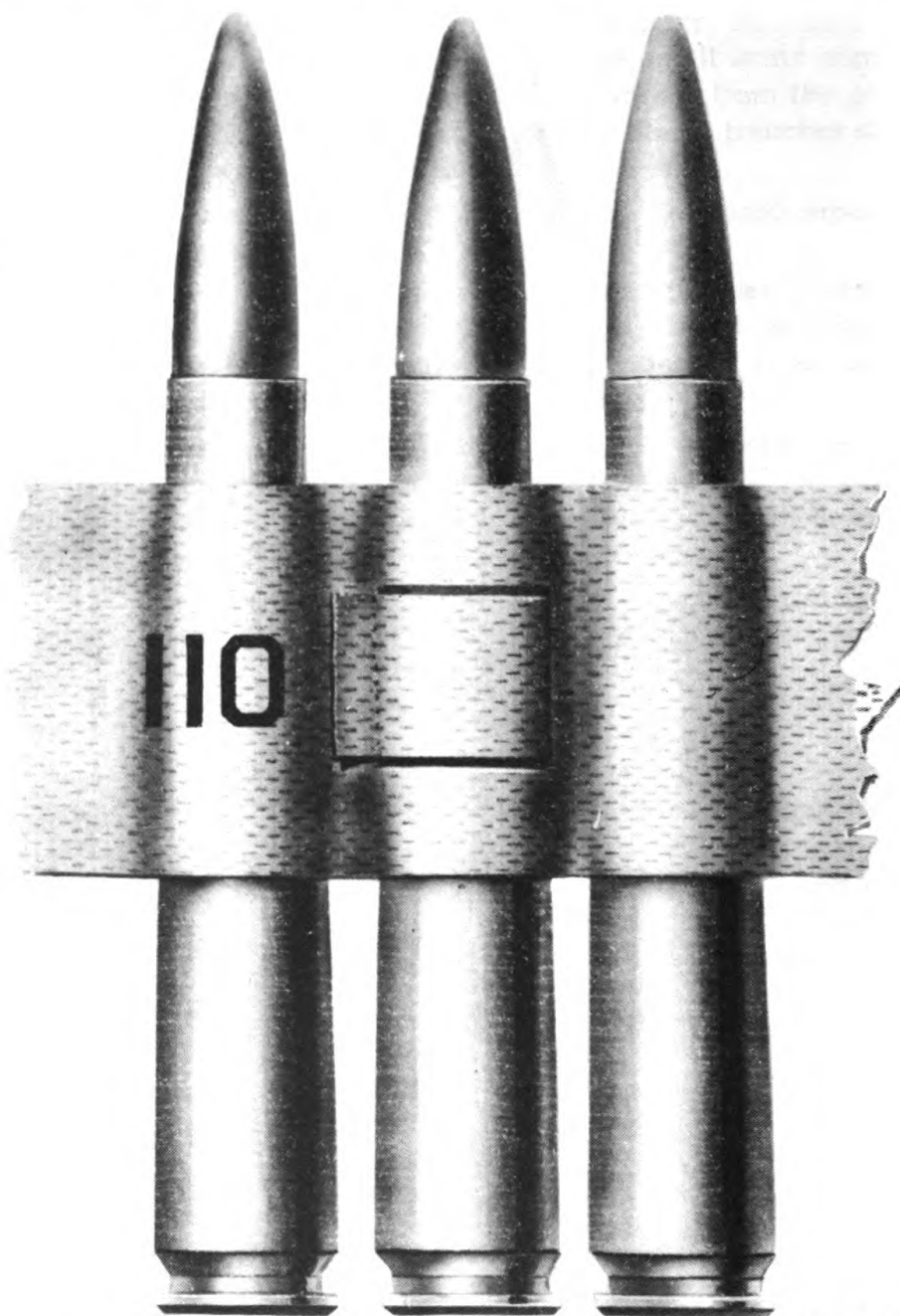


RA PD 61184

**Figure 127 — Section of Linked Belt, Cal. .50, Loaded with CARTRIDGE, Armor-piercing, cal. .50, M2**



**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**



RA PD 69031

**Figure 128 — Section of Machine Gun Fabric Belt, Cal. .50, Loaded with CARTRIDGE, Armor-piercing, Cal. .50, M2**

**101. SUBCALIBER AMMUNITION.**

a. Gun, machine, cal. .30, Browning, M1917A1, on the Mount M2 or M2A1, is used for subcaliber purposes with Gun, machine, cal. .50, M2, water-cooled, flexible. For subcaliber purposes, CARTRIDGE, ball, cal. .30, M1, or CARTRIDGE, ball, cal. .30, M2, only, will be used.

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The identification and precautions in handling and use for cal. .30 cartridges are similar to those for cal. .50 cartridges described in this section. In addition, precautions in AR 750-10, Range Regulations For Firing Ammunition For Training And Target Practice, will be observed.

### 102. DEFECTS FOUND AFTER FIRING SMALL ARMS AMMUNITION.

TABLE I

Name of Defect	How to Recognize	Common Causes, Precautions
<i>Misfire.</i>	No action on firing. Primer shows normal impression of firing pin.	Primer is defective.
	No action on firing. Primer shows light impression of firing pin.	Indicates mechanical defect in weapon as short or broken firing pin, weak firing pin spring, bolt of weapon not being completely locked, or grease in firing pin hole which cushions blow of firing pin, or caused by defective cartridge or primer.
	No action on firing. Primer shows normal impression of firing pin, but off center.	Defect in weapon.
<i>Hangfire.</i>	Delayed ignition of powder in the cartridge.	Small or decomposed primer pellet, damp powder or light blow of firing pin caused by dirt or defect in weapon. This is a serious defect if delay is long enough to permit the bolt to be opened before the powder burns completely, in which case injury to firer or damage to weapon, or both, may result.
<i>Pierced Primer.</i>	Perforation of primer cup by the firing pin. Discoloration around indent of very small perforation. Disk from large perforation blown into action of gun, with such an escape of gas as to lower velocity of the shot.	Imperfect firing pin or very thin metal in base of primer cup.
<i>Primer Leak.</i>	Discoloration around the primer and the head. Slight discoloration when primer leak is small, or heavy for a large primer leak.	Too small a primer, too large a primer hole, or excessive pressure generated by propelling charge.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

Name of Defect	How to Recognize	Common Causes, Precautions
<i>Blown Primer.</i>	Primer is blown completely from pocket of cartridge case.	Serious defect but seldom encountered.
<i>Primer Setback.</i>	Primer protrudes above the metal head.	Defective bolt or cartridge, or excessive pressure.
<i>Leak Back of Case.</i>	Discoloration along body of cartridge case.	Escape of gas into the action of weapon.
<i>Failure of Case to Extract.</i>	Failure of case to extract.	Defective extractor or cartridge.
<i>Blowback.</i>	Escape of gas to the rear.	Pierced primer, primer leak, blown primer, and ruptured cartridge case.
<i>Split Neck.</i>	Neck of case splits and is accompanied by escape of gas to the rear, upon firing.	Not to be confused with a split neck due to season cracking which can be observed before firing.
<i>Split Body.</i>	Longitudinal split in body of case, thereby reducing velocity of the shot.	Body of case made of defective material or has a deep draw scratch.
<i>Stretch.</i>	Continuous ring around the body of a fired cartridge case.	Generally due to improper head space.
<i>Complete Rupture.</i>	Circumferential separation completely around body of cartridge case, causing it to separate into two parts.	Bad bolt locking, excessive head space, or defective cartridge case. This is a serious defect, because if the forward portion of case remains in the chamber after extraction, it will cause the next round to jam.
<i>Partial Rupture.</i>	Partial circumferential separation around body of cartridge case.	See <i>Complete Rupture</i> .

**103. FIELD REPORTS OF ACCIDENTS.**

a. When an accident involving the use of ammunition occurs during training practice, the procedure prescribed in section VIII, AR 750-10, will be observed by the ordnance officer under whose supervision the ammunition is maintained or issued. Where practicable, reports covering malfunctions of ammunition in combat will be made to the Chief of Ordnance, giving the type of malfunction, type of ammunition, the lot number of the complete rounds or separate-loading components, and conditions under which fired.

## Section XII

### SUBCALIBER EQUIPMENT

	Paragraph
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General data for Browning machine gun, cal. .30, M1917A1, water-cooled .....	105
Mounting .....	106
General care of gun.....	107
Lubrication of subcaliber machine gun, cal. .30, M1917A1 .....	108
Description of subcaliber cradle for A.A. mounts M2 and M2A1 .....	109
Organizational spare parts and accessories for subcaliber equip- ment .....	110

#### 104. PURPOSE.

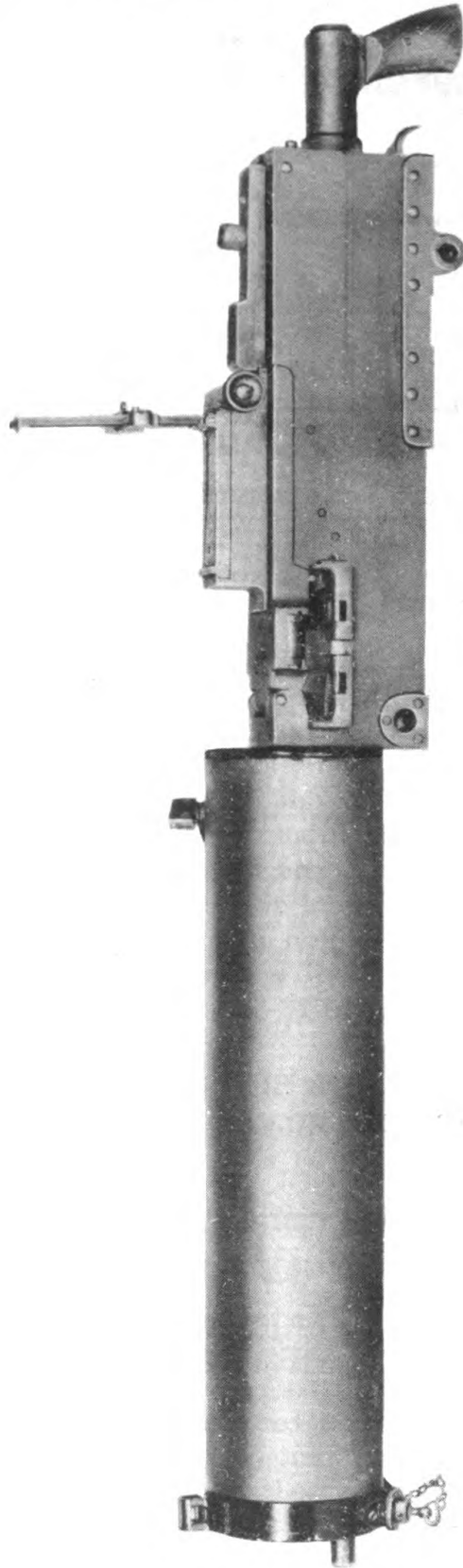
a. Subcaliber equipment, which is used for training purposes only, and is not taken into the theater of operations, consists of the subcaliber Browning Machine Gun, cal. .30, M1917A1, Water-cooled (fig. 129), and the subcaliber antiaircraft cradle (fig. 130) and accessories. This equipment is used to provide practice in laying and firing the cal. .50 materiel. The use of small bore ammunition prevents wear on the regular piece during practice and is less costly. The actual handling, loading, and range obtained are different between the subcaliber and service materiel. For ammunition used for this subcaliber gun, refer to paragraph 101, section XI. Full information concerning this gun, for using arms is contained in FM 23-55.

#### 105. GENERAL DATA FOR BROWNING MACHINE GUN, CAL. .30, M1917A1, WATER-COOLED.

##### a. Data.

Weight of gun, without water.....	32.6 lb
Weight of gun, with water.....	41.0 lb
Weight of belt, empty .....	7.5 oz
Weight of belt, filled, 250 rounds in chest.....	20.50 lb
Length of barrel .....	24.00 in.
Rate of fire .....	400 to 525 shots per min
Muzzle velocity, approximate .....	2,700 ft per sec

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**



RA PD 4165

**Figure 129 — Browning Machine Gun, Cal. .30, M1917A1**

## **SUBCALIBER EQUIPMENT**

### **106. MOUNTING.**

a. The subcaliber Browning Machine Gun, cal. .30, M1917A1 is supported by the subcaliber cradle, assembled to the A.A. Machine Gun Mounts, cal. .50, M2 and M2A1, as described in paragraph 109.

### **107. GENERAL CARE OF GUN.**

a. It is essential that the gun be maintained in the best mechanical condition at all times; it must always be kept clean and covered with a light coating of oil. Care and cleaning will not be confined to the gun alone, but will include the mount and all accessories. Belts and ammunition must be kept clean and dry. For detailed information concerning care and cleaning of this gun, refer to FM 23-55.

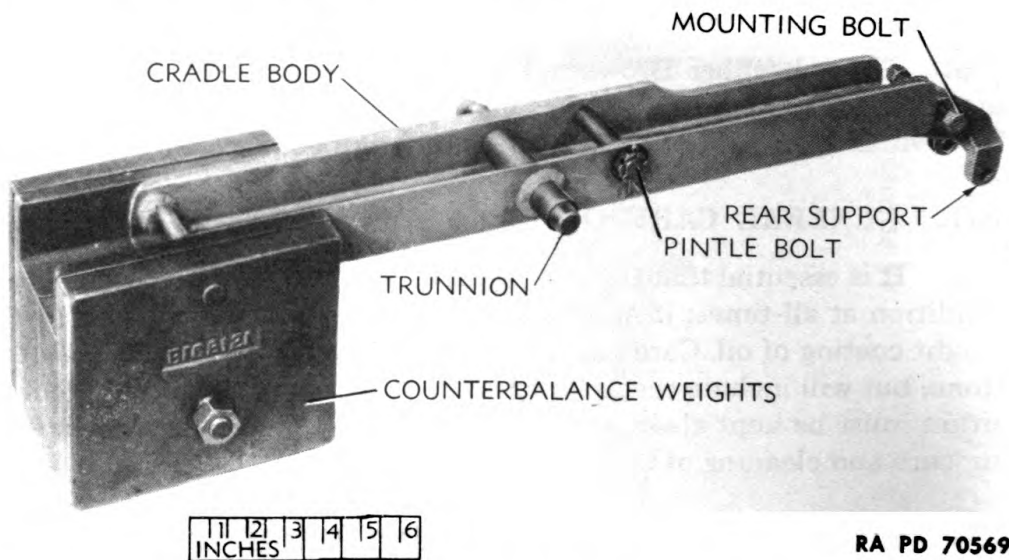
### **108. LUBRICATION OF SUBCALIBER MACHINE GUN, CAL. .30, M1917A1.**

a. Oiling and lubrication of this subcaliber gun is accomplished in a manner similar to that prescribed for the Gun cal. .50, M2 as covered in sections V and XIV of this manual. When mounted and not in use, the subcaliber gun should be protected from the weather by a tarpaulin, and inspected, cleaned, oiled, and lubricated daily, to prevent rust. When unmounted, it should be cared for in a manner similar to the Gun cal. .50, M2 above. Parts should always be wiped clean before oiling or lubricating.

### **109. DESCRIPTION OF SUBCALIBER CRADLE FOR A.A. MOUNTS M2 AND M2A1.**

a. **General Description.** This subcaliber cradle (fig. 130) is used for mounting the Machine Gun, cal. .30, M1917A1, Water-cooled on the Antiaircraft Mounts, cal. .50, M2 and M2A1. The cradle consists of a set of four counterbalance weights, a cradle body to which is welded a trunnion, counterweight stud, and a subcradle rear support. The counterbalance weights have two holes: the uppermost is used for insertion of the counterweight stud; the lower for insertion of a 6½-inch hexagonal-head cap screw. This cap screw, when in place, is held firm by a hexagonal nut and a lock washer locking the counterbalance weights in place on the fore part of the subcaliber cradle. The subcaliber cradle is held in place by inserting the pintle bolt, which is directly behind the trunnion, through the holes supplied in the subcaliber cradle and the front mounting holes on the machine guns. After the pintle bolt is in place, the pintle bolt nut is placed in position and locked with a cotter pin. The mounting bolt is then inserted through the subcaliber cradle rear support and rear mounting holes on the machine gun, and held in place with a safety nut.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**



RA PD 70569

**Figure 130 — Subcaliber Cradle for A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1, for Mounting Browning Machine Gun, Cal. .30, M1917A1**

**110. ORGANIZATIONAL SPARE PARTS AND ACCESSORIES FOR SUBCALIBER EQUIPMENT.**

**a. Organizational Spare Parts.** A set of spare parts is supplied to the using arms for field replacement of those parts most likely to become broken, worn, or otherwise unserviceable. The set should be kept complete at all times by requisitioning new parts for those used. For listing of organizational spare parts for the subcaliber gun see SNL A-5.

**b. Accessories.**

(1) Accessories include the tools and equipment required for such disassembling and assembling as the using arms are authorized to perform, and for cleaning and preserving the subcaliber gun. Accessories should not be used for purposes other than those prescribed, and when not in use should be properly stored.

(2) There are a number of accessories, the names or general characteristics of which indicate their use. Others, embodying special features or having special uses, are described in the following paragraphs:

(a) *Ammunition Belt, Cal. .30, M1917 (250 rounds).* The ammunition belt is made of woven fabric with loops to hold the cal. .30 cartridges. This belt has a brass strip at each end to facilitate loading.

(b) *Chamber Cleaning Brush, M6.* This cleaning brush, used for cleaning chamber of the cal. .30 machine gun, consists of bristles held in place by a twisted steel wire, which constitutes the body of the brush.

(c) *Cleaning Brush, Cal. .30, M2.* This brush (fig. 131) consists of wire bristles held in place by a twisted spiral core soldered to a

SUBCALIBER EQUIPMENT

RA PD 66221

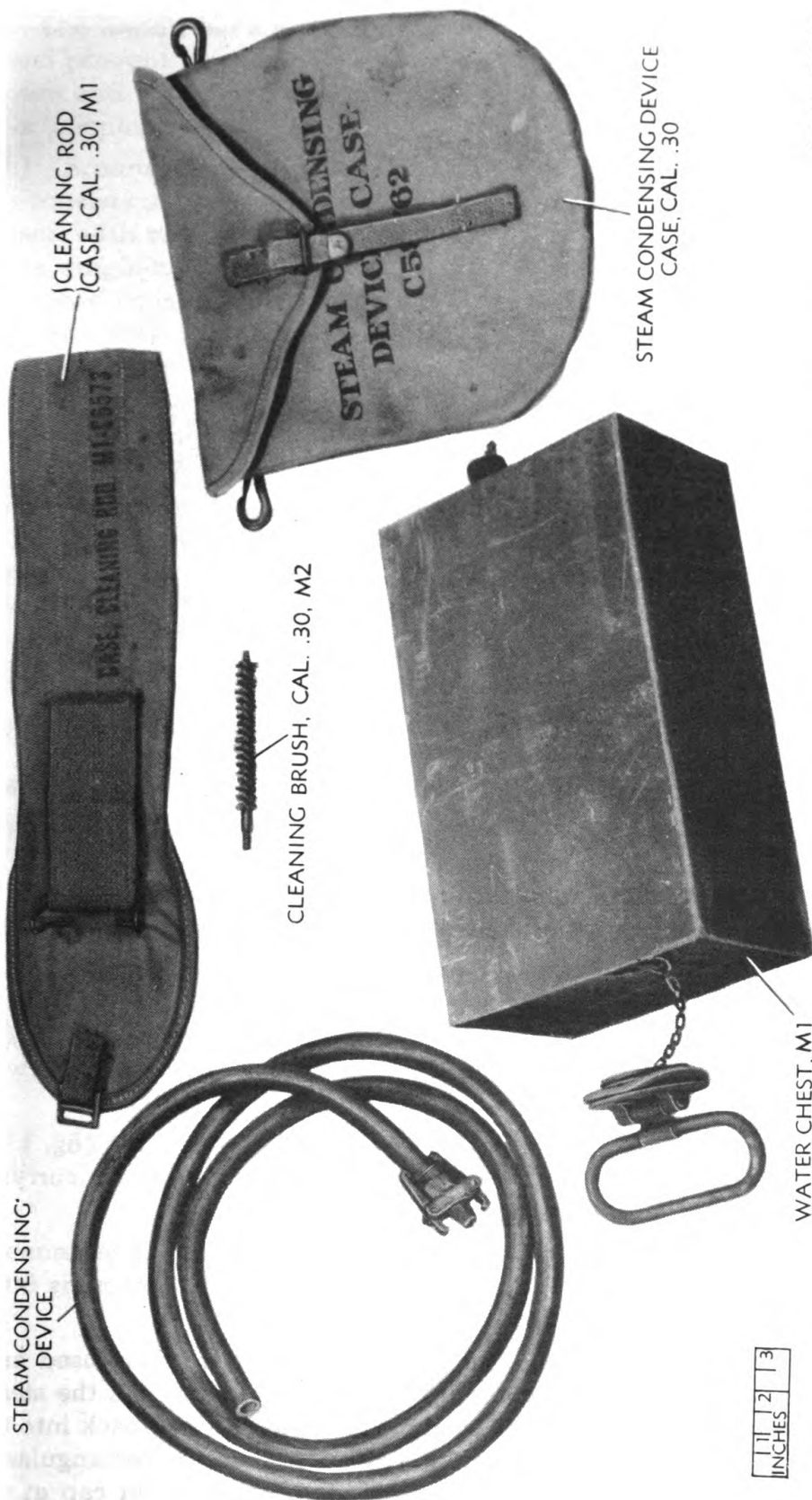
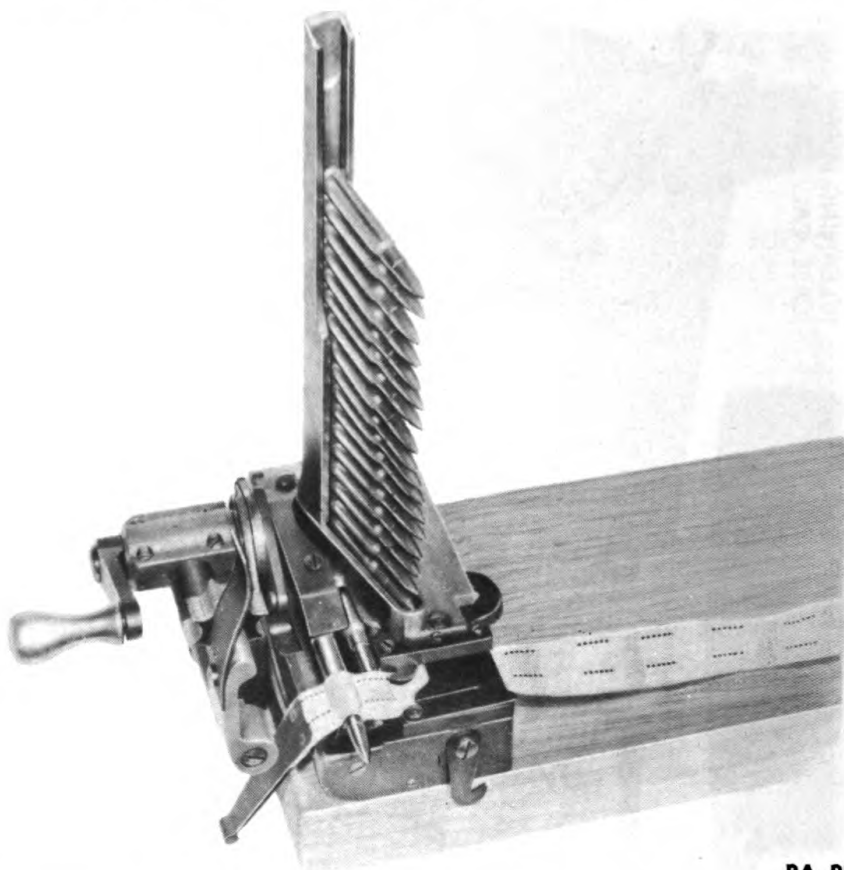


Figure 131 — Accessories for Browning Machine Gun, Cal. .30, M1917A1

1 1 2 3  
INCHES



## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 36602

**Figure 132 — Browning Belt Filling Machine, Cal. .30, M1918**

threaded tip, which enables fastening of brush assembly to the cleaning rod for cleaning bore of the cal. .30 machine gun.

(d) *Cleaning Rod Case, Cal. .30, M1.* The case (fig. 131) is a fabric container with five pockets, four of which hold the sections of the jointed cleaning rod, while the fifth holds the cleaning brush. The contents are secured in their pockets by a web billet and chape with buckle.

(e) *Steam Condensing Device Case, Cal. .30.* This case (fig. 131) is of canvas material fitted with straps and hooks, used for carrying the cal. .30 steam condensing device.

(f) *Ammunition Belt Chest, Cal. .30 (250-round).* The ammunition chest is used to hold the belted ammunition. The chest is fitted by means of slots to the ammunition chest support.

(g) *Water Chest, M1.* The water chest (fig. 131) is used as a reservoir for holding the water after it has passed through the steam condensing device. The water when cool, is then poured back into the water jacket of the gun as needed. This water chest is rectangular in shape, having a carrying handle at one end, and a drain cap at the

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other. The handle has a retainer and chain attached to facilitate recovery and prevent loss when chest is in operation. The drain cap at the opposite end is fastened to a link by means of a ring used to prevent loss or misplacement.

(h) *Steam Condensing Device*. The steam condensing device (fig. 131) consists of two pawls with springs fastened to a connection, held in place with pins or rivets. This assembly is attached to a 72-inch flexible single-braid steam hose. To use this device, remove stopper from lipped connection in fore part of water jacket. Insert steam device connection with jaw-shaped pawls open, and when insertion has been completed, release tension on pawls, allowing them to grip rim of lipped connection. This prevents the connection from dropping out when the gun is in operation. Insert other end of steam hose into water chest. The device is then ready for operation.

(i) *Browning Belt Filling Machine, M1918*. This machine (fig. 132) is for the rapid loading of belts of cal. .30 ammunition, and is intended to be fastened to a table or bench while in use. For use of this device, refer to FM 23-55.

**NOTE:** In a modification of this machine, the needles are replaced by a shuttle. The needle-type machine is covered in FM 23-55.

(j) *Cleaning Rod, Cal. .30, M2A1*. This cleaning rod consists of a rod, adapter, and grip fastened together with a pin. This rod, with cleaning brush attached thereto, is used for cleaning bore of gun.

(k) *Jointed Cleaning Rod, Cal. .30, M1*. This is a steel rod of five sections. The rear section is provided with a handle which swivels on the rod. The first section has a slot formed for holding a cleaning patch, and a threaded hole for attaching the cleaning brush.

(l) *Combination Wrench, M6*. This combination wrench is used to remove or replace the cover bolt nut, cocking lever pin, push pin, ejector pin, gland, or water plug, when disassembling or assembling the cal. .30 machine gun.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

**Section XIII**

**ORGANIZATIONAL SPARE PARTS AND ACCESSORIES**

	Paragraph
Organizational spare parts .....	111
Accessories .....	112

**111. ORGANIZATIONAL SPARE PARTS.**

a. A set of spare parts is supplied to the using arms for field replacement of those spare parts most likely to become broken, worn, or otherwise unserviceable. The set should be kept complete at all times by requisitioning new parts for those used. For listing of organizational spare parts for the cal. .50 machine gun, see SNL A-37.

b. Care of spare parts is covered in paragraph 69.

**112. ACCESSORIES.**

a. Accessories include the tools and equipment required for such disassembling and assembling as the using arms are authorized to perform, and for cleaning and preserving the gun and mounts. Accessories should not be used for purposes other than those prescribed, and when not in use, should be properly stored.

b. There are a number of accessories, the names or general characteristics of which indicate their use. Others, embodying special features or having special uses, are described in the following paragraphs.

**(1) ACCESSORIES FOR CAL. .50 MACHINE GUN.**

(a) *Cleaning Brush, Cal. .50, M4.* This brush (fig. 133) consists of the core, bristles, and tip. The brass wire core is twisted in a spiral, and holds the bronze bristles in place. The core is secured in the brass tip which is threaded for attaching the brush to the cleaning rod.

(b) *Cleaning Rod Case M15.* The case (fig. 133) is a fabric container with five pockets, four of which hold the sections of the jointed Cleaning Rod M7, while the fifth holds the Cleaning Brush, cal. .50, M4. The contents are secured in their pockets by a web billet and chape with buckle.

**(c) *Water Chest M3.***

1. *General description.* This unit (fig. 134) consists of a hand-operated, chain-driven rotor pump mounted in a steel chest with the necessary hose and connections. The pump is operated while firing, causing circulation of water in the water jacket of the gun, thereby keeping the gun barrel cool.

2. *Method of connecting to machine gun.* The water chest and the machine gun water jacket should first be filled with water. In filling

ORGANIZATIONAL SPARE PARTS AND ACCESSORIES

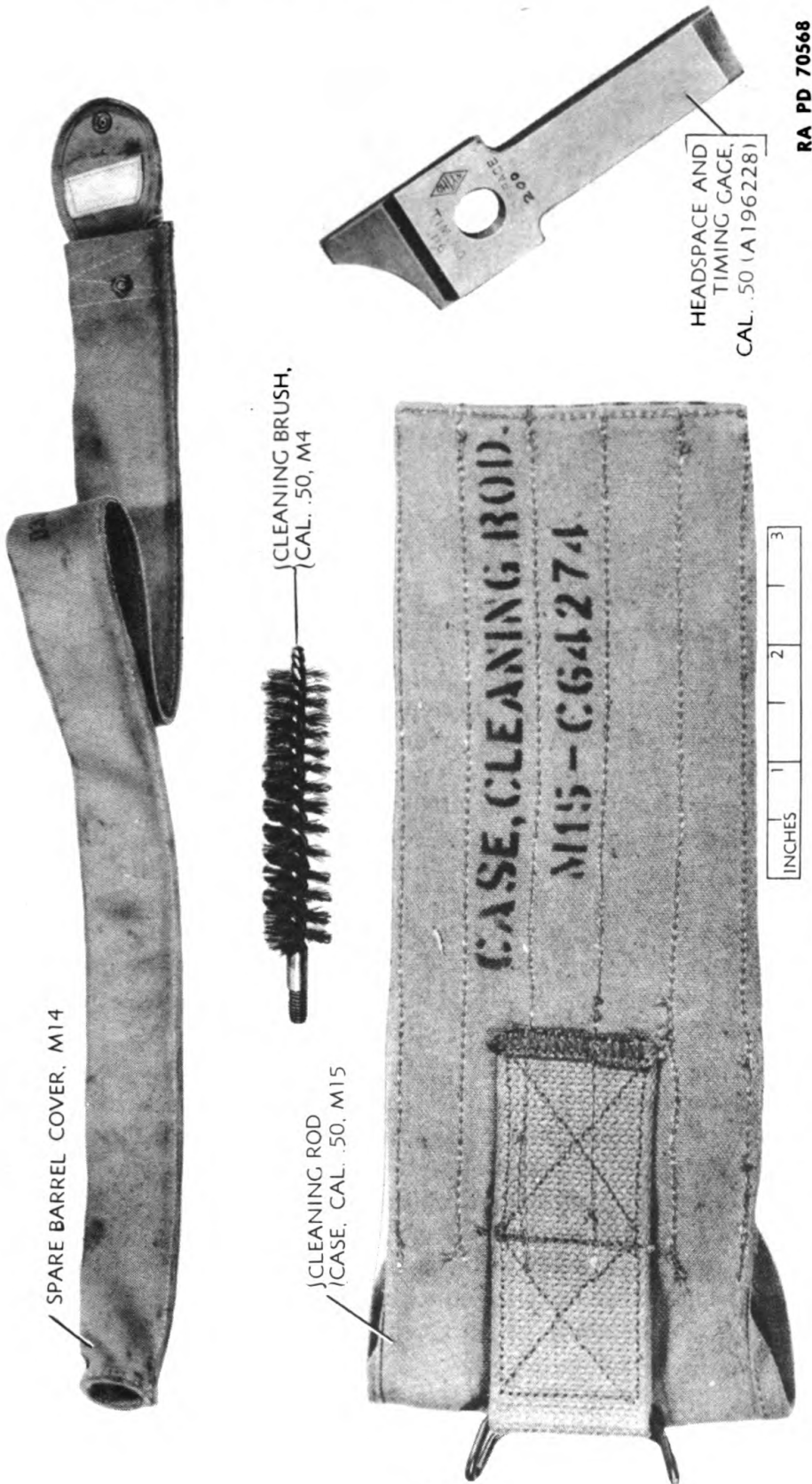


Figure 133 — Accessories — Browning Machine Gun, Cal. .50, M2 — Flexible — Water-cooled

## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 66228

**Figure 134 — Water Chest, Cal. .50, M3 with Hose**

the water chest, unscrew the filler cap but do not remove the filler cap strainer. Remove the handhole cover by inserting the two index fingers into the 1-inch holes and pull out. The cover, held in position by two clip springs, will snap out, allowing access to the pump, pump handle, and union caps. Remove the union caps from the outlet and inlet ports. Connect one hose from the large outlet in the chest to the small hose connection bushing in the machine gun water jacket. Connect the other hose from the small inlet in the chest to the large hose connection bushing in the machine gun water jacket. Place the handle in pumping position, and replace the handhole cover. The water chest is then ready to operate.

3. *Method of operation.* Turn the crank in a clockwise direction as indicated by arrow on handhole cover. Rotate with a steady motion at the rate of approximately 35 revolutions per minute. This causes a steady stream of water to circulate through the water system. In order to make the most effective use of the water chest, the pump should be operated whenever bursts of 25 or more rounds are being fired, and continued without stop throughout the firing, and thereafter, until the temperature of the water in the machine gun is lowered to the temperature of water in the chest.

4. *Method of removing and replacing pump.* Remove the handhole cover by inserting the two index fingers into the 1-inch holes and pull out. The cover, held in position by two clip springs, will snap out, allowing access to the pump, pump handle, and union caps. Unscrew

## ORGANIZATIONAL SPARE PARTS AND ACCESSORIES

the 10 socket-head cap screws which are evenly spaced around the edge of the pump. To remove the cap screws, use a socket-head set screw wrench. In order to loosen two of the cap screws, the wrench must be inserted through the holes in the large sprocket. Remove the pump body from the chest. If pump is to be disassembled, it must be done by ordnance personnel. The pump is replaced in the chest in the reverse order of that in which removed.

**CAUTION:** In replacing pump in chest, the 10 pump body cap screws should be screwed down gradually and evenly to avoid distortion of pump body and consequential misalignment of pump rotor.

5. *Care and cleaning.* The strainer, which is attached to the brass suction pipe within the water chest, should be cleaned occasionally. This is done by removing the filler cap and filler cap strainer, inserting



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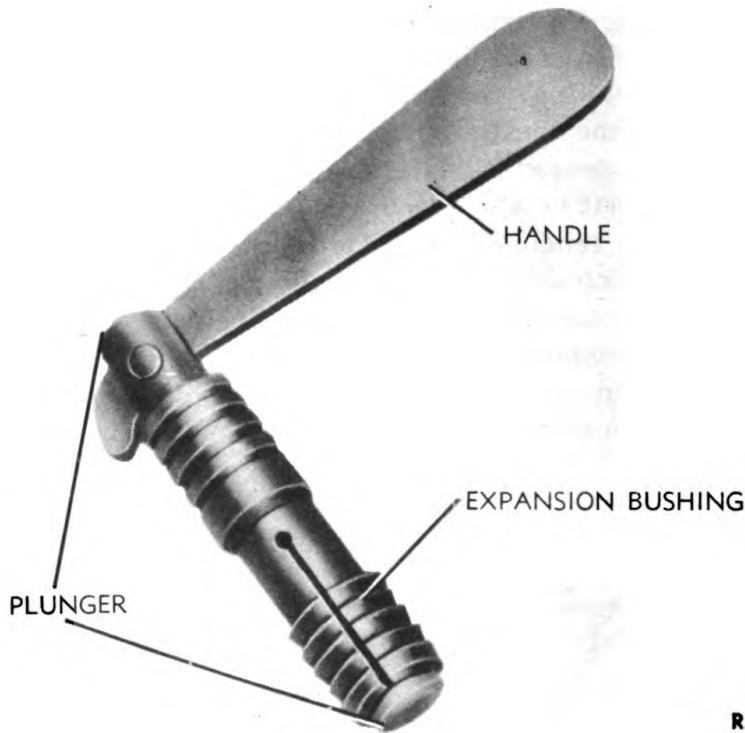
**Figure 135 — Link Loading Machine, Cal. .50, M2 (10 rounds)**

the arm through the hole, and rubbing the finger or a brush across the face of the strainer. When the water chest is not in service, remove the filler cap and filler cap strainer, drain out the water by removing the brass drain plug, and thoroughly dry the interior through the hole by wiping with waste or rags. Replace the filler cap strainer, filler cap, drain plug, and the union caps of the inlet and outlet ports. Put the crank in the pump compartment and snap the handhole cover in place.

(d) *Gun Cover M15.* This is a 45-inch stitched canvas cover used to protect the gun when not in use, or when traveling.



## BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS



RA PD 82859

**Figure 136 — Ruptured Cartridge Extractor, Cal. .50, M5**

(e) *Spare Barrel Cover M14.* This is a stitched canvas cover (fig. 133) used to protect the 45-inch spare barrel from dirt or grit, when it is not in use or when traveling.

(f) *Cal. .50 Headspace and Timing Gage A196228.* This gage (fig. 133) is used to obtain the proper distance between the face of the bolt and the rear end of the barrel. The headspace adjustment must be checked before firing.

(g) *Link Loading Machine M2 (10-round).* The link loading machine (fig. 135) is used for rapid loading of ammunition into metallic links. It may be screwed to a bench, ammunition box, or other suitable support when in use, screw holes being provided in its base for this purpose. Links, properly assembled, are placed on the loading bed (flange down, small loop forward, and double loop to right) adjacent to the U-shaped stops, and cartridges are placed in the grooves provided. The loading is performed by the operation of the loading handle which, when pushed forward to the stop, will load the cartridges to the correct depth in the links. Care should be taken to handle properly that portion of the loaded belt that is adjacent to the section being loaded.

(h) *Ruptured Cartridge Extractor, Cal. .50, M5* (fig. 136). This ruptured cartridge extractor consists of a handle attached by a pin

## ORGANIZATIONAL SPARE PARTS AND ACCESSORIES

to a plunger. At the handle end of the plunger an inner bushing and coil spring are assembled. Over the plunger, inner bushing and coil spring, an outer bushing is assembled. This outer bushing, called the expansion bushing, is split partway to permit expansion, and the outer surface is furnished with teeth. The ruptured cartridge extractor is for the purpose of removing ruptured cartridge cases from the chamber of the machine gun barrel, and is used as follows:

1. Raise cover of gun, and retract and hang the bolt.
2. Insert plunger and expansion bushing into portion of cartridge case which is stuck in the chamber of the barrel. When inserted, the handle of the extractor should point up, and the rounded projection on the pivot end should bear against the rear face of the barrel.
3. Move the handle of extractor downward. The movement will pull the plunger back and expand the expansion bushing, causing the teeth on the outer surface of the bushing to grip the cartridge case.
4. Continue to move the handle downward. The plunger will continue its rearward movement, pulling the cartridge case with it through the medium of the expansion bushing.
5. Check the headspace carefully after removing the ruptured cartridge case.

(i) *Oil Buffer Filling Oiler.* This oiler consists of a  $\frac{1}{2}$ -pint capacity oilcan with a nozzle 5 inches long. It is used only for filling the oil buffer.

(j) *Cleaning Rod, Cal. .50, M6.* This rod consists of two sections permanently fastened together. The rear section is provided with a tubular steel handle which swivels on the rod. The front section has a threaded hole for attaching the cleaning brush, and a slot for holding a cleaning patch.

(k) *Jointed Cleaning Rod, Cal. .50, M7.* This is a steel rod (fig. 137) of five sections, the first two of which are permanently fastened together. The rear section is provided with a tubular steel handle which swivels on the rod. The first section has a slot formed for holding a cleaning patch, and a threaded hole for attaching the cleaning brush.

(l) *Packing Ring Adjusting Wrench.* The wrench (fig. 137) which is used to turn the packing adjusting ring when adjusting the packing on the rear of the barrel is a single-end spanner wrench, having its handle bent at an angle. At the end of the arc of the spanner wrench a cylindrical lug is formed. When in use, this lug engages in one of the several holes formed in the packing adjusting ring.

(m) *Combination Wrench M2.* This is a special tool (fig. 137) for disassembling, assembling, and making adjustments of the gun. Each opening and projection is marked to show its purpose.

(n) *Barrel Holding Wrench.* This wrench (fig. 137) is used to hold



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Figure 137 — Accessories — Browning Machine Gun, Cal. .50, M2 — Flexible — Water-cooled

## ORGANIZATIONAL SPARE PARTS AND ACCESSORIES

the barrel when using the packing ring adjusting wrench. It is made of flat steel,  $\frac{1}{8}$  inch thick,  $\frac{7}{16}$  inch wide, and 3 inches long. One end is shaped to adapt it to the serrations and general contour of the barrel.

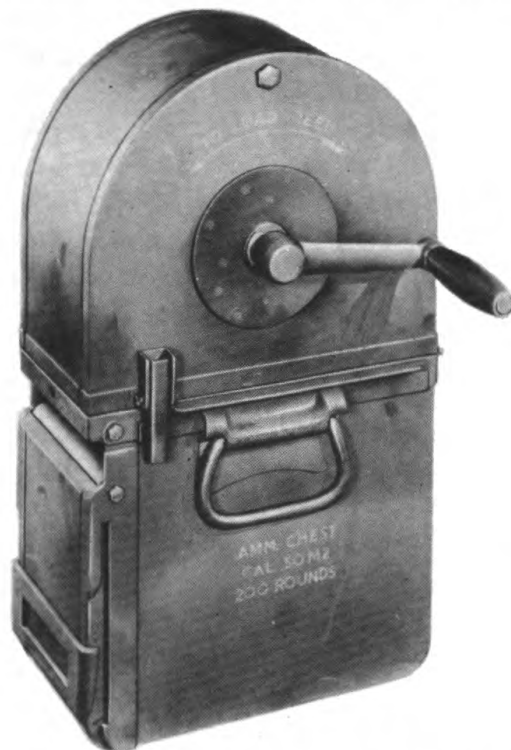
(o) *Pipe Strap Wrench, Cap. 2-5 inches.* This wrench (fig. 137) is used in removing the water jacket. The wrench consists of an all metal handle, and a woven fabric strap.

### (2) ACCESSORIES FOR CAL. .50, MACHINE GUN MOUNTS.

(a) *Metallic Belt Link Bag.* This canvas bag is secured to the link chute of the mount to catch the ejected metallic cartridge links.

#### (b) *Ammunition Chest, Cal. .50, M2.*

1. *General description.* The ammunition chest (fig. 138) provides a convenient means of handling and feeding belted ammunition. The chest is attached to the mount by means of slots on the sides of the chest. A removable crank is provided for use in loading the chest. The chest is made of steel and equipped with a hinge, so that the upper half may be swung back for purposes of filling and cleaning. Latches are provided for locking the upper half in place. The upper half is provided with a spindle (reel), on which fins are formed, which is rotated by the removable crank, and a cartridge filler piece located around the spindle and mating with the fins. The lower half is provided with rollers to facilitate feeding, and a spring-operated stop to prevent the ammunition belt from dropping back when the tension is released.



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Figure 138 — Ammunition Chest, Cal. .50, M2

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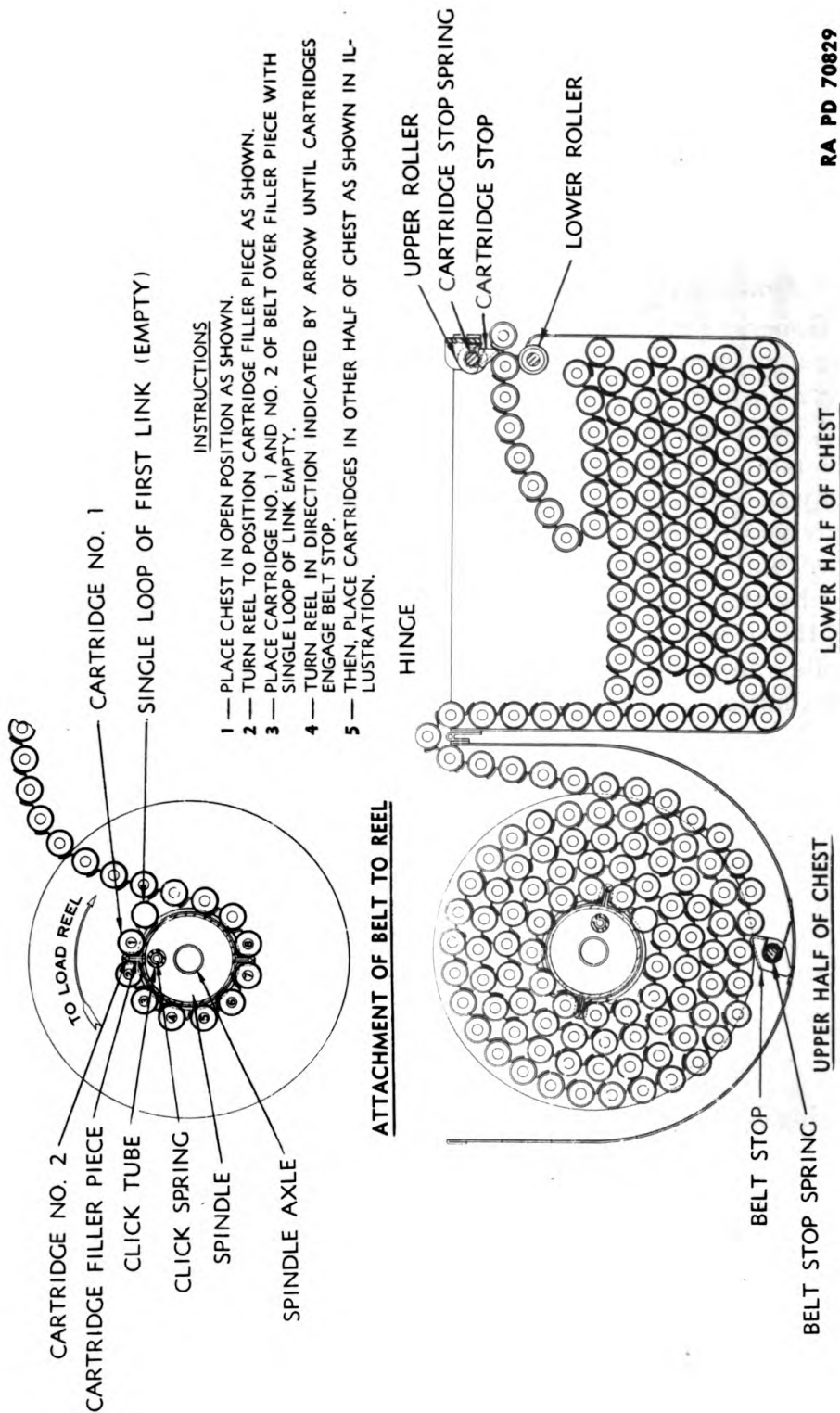


Figure 139 — Method of Filling Ammunition Chest, Cal. .50, M2 — Right Side Sectional View

**ORGANIZATIONAL SPARE PARTS AND ACCESSORIES**

The upper half is also provided with a spring-operated stop to hold the belt on the reel while closing the chest.

2. *Method of filling chest* (fig. 139). Lock the cartridge filler piece in place over the projecting fins on the spindle by means of the set screw in the filler piece. (The position of the filler piece on the spindle is dependent upon whether left- or right-hand feed is contemplated, so as to engage the bullet end of the cartridge. The filler piece should be positioned over the front fin, when the chest is mounted.) Place the open single-loop end of the ammunition belt over cartridge filler piece, so that the fins on filler piece and spindle are between the first and second cartridges with the filler piece at the bullet end. Rotate the spindle in direction indicated by means of the crank. It may be necessary to hold the first layer of cartridges in place as the spindle is rotated. Fill the spindle to approximately the height of upper half of the chest, so that the belt stop engages and holds the belt. Pass the belt over hinge and down along back of lower half, and along bottom of chest to the front. Then fill the lower half of the chest in layers until chest is filled to capacity (200 cartridges), and pass the first cartridge, seated in the *double-loop* of the end link, through the rollers when ready to load the gun. The points of the bullet should point to the front when chest is mounted.

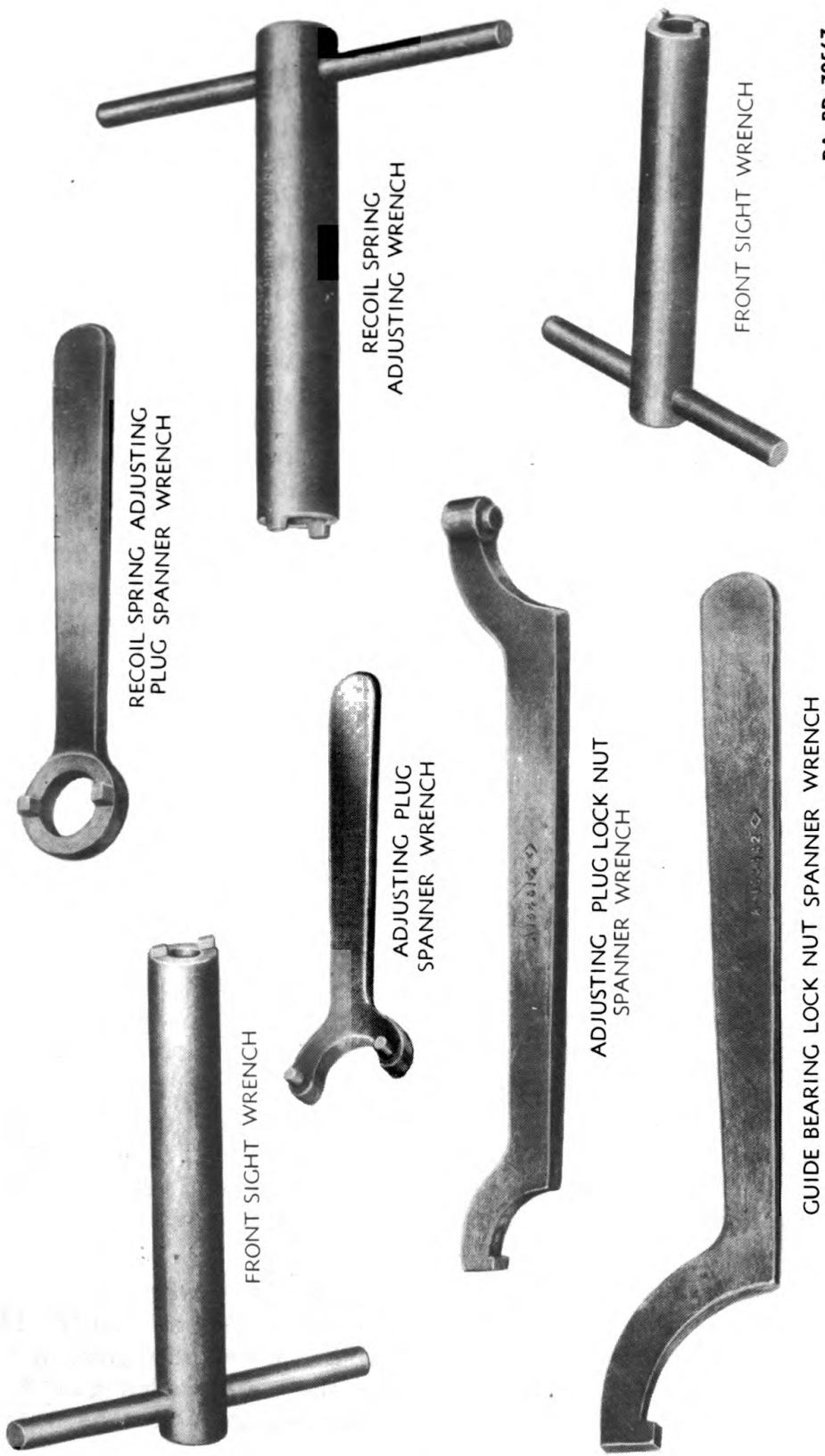
3. *Method of adjustment of spindle tension*. On new chests the preferable tension is between 5 and 7 pounds when applied at the crank handle. A tension of 7 pounds is specified as chests will work at a somewhat reduced load after they have been worked in. To obtain the proper tension of 7 pounds, proceed as follows: Insert crank in spindle axle and attach a spring scale or a 7-pound weight to the crank handle. Insert a screwdriver through the hole in side of chest, and adjust the click tube adjusting screw until the desired tension is obtained, when the crank is in a horizontal position.

4. *Care of chest*. The chest must be kept closed, and the inside clean, to prevent grit from being carried into the action of the machine gun. The rollers and spindle bearings must be oiled daily with OIL, lubricating, preservative, light.

(c) *Antiaircraft Sight M1*. This antiaircraft sight (fig. 92) is designed for use with the M2A1 Pedestal or M2A1 Tripod Machine Gun Mount. The sight is of all-metal construction. It is strapped in a fixed position to the fore part of the cal. .50 machine gun water jacket, having the small ring foremost.

(d) *Counterbalance Weight*. This weight is used when the cal. .50 heavy barrel or cal. .50 aircraft machine gun is mounted on the M3 Mount. Its purpose is to act as a counterbalance weight in place of the water contained in the water jacket of the water-cooled gun. The mount does not require the counterbalance weight when the water-cooled gun is used.

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RA PD 70567

Figure 140 — Accessories — A.A. Machine Gun Mounts, Cal. .50, M2 and M2A1

**ORGANIZATIONAL SPARE PARTS AND ACCESSORIES**

(e) *Recoil Spring Adjusting Wrench.* This wrench (fig. 140) consists of a tubular body with a handle at one end, and two lugs at the other end. It is inserted in the bearing of the recoil mechanism, and fitted into the slots of the adjusting plug nut. Thereby, the adjusting plug nut may be turned in either direction until the proper adjustment of the spring is obtained (M2 and M2A1 Mounts).

(f) *Front Sight Wrenches.* These wrenches (fig. 140) are T-shaped with a handle at one end, and two lugs at the other end. They are used in adjusting various components of the front sight mechanism (M2 Mount).

(g) *Adjusting Plug Spanner Wrench.* This pin-type spanner wrench (fig. 140) is used in adjusting various components of the front sight mechanism (M2 Mount).

(h) *Adjusting Plug Lock Nut Spanner Wrench.* This combination spanner wrench (fig. 140) is used to tighten or loosen the adapters of the front sight mechanism (M2 Mount), and to adjust the locking nut and adjusting plugs of the recoil mechanism (M2 and M2A1 Mounts).

(i) *Guide Bearing Lock Nut Spanner Wrench.* This hook spanner wrench (fig. 140) is used to adjust the locking nuts of the recoil mechanism (M2 and M2A1 Mounts).

(j) *Recoil Spring Adjusting Plug Spanner Wrench.* This is a flat key-type spanner wrench (fig. 140) with a circular end, and is used to turn the adjusting plug until the proper adjustment of the spring is obtained (M2 and M2A1 Mounts).

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**Section XIV**

**OPERATION UNDER UNUSUAL CONDITIONS**

	Paragraph
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Cleaning and lubrication in cold climates.....	114
Cleaning and lubrication in hot climates.....	115
Care when located near salt water .....	116
Care of the oil buffer .....	117
Care of the water jacket and chest.....	118

**113. GENERAL.**

a. When operated under unusual conditions, where extremes of temperature and humidity occur, special care should be observed with regard to the cleaning, oiling, and lubrication of the guns and mounts. Such care is most necessary to insure proper operation and functioning of the mechanisms, and to guard against excessive wear of the moving parts and deterioration of the materiel. Special care of the materiel under various conditions is explained in this section.

**114. CLEANING AND LUBRICATION IN COLD CLIMATES.**

a. In temperatures below freezing, it is necessary that the moving parts of the machine gun and mounts be kept absolutely free from moisture. It has also been found that excessive oil on the working parts will solidify to such an extent as to cause sluggish operation and functioning, or complete failure. This applies, in particular, to the firing mechanism and small spring-operated parts. Special care should be taken to eliminate all grease, excess oil, and fouling from the following parts and assemblies:

- (1) Bore and chamber of the barrel.
- (2) Firing pin group and pin tunnel in bolt.
- (3) Sear spring and seat in bolt.
- (4) Driving spring group and tunnel in bolt.
- (5) Switch.
- (6) Feed lever plunger spring and seat.
- (7) Belt feed pawl and holding pawl springs and seats.
- (8) Side plate trigger on gun.
- (9) Trigger control mechanism slide group on mount.
- (10) Elevating and traversing sight screws of the M2 mount.
- (11) Pintle and seat in pedestal of M2 and M2A1 Mounts, and ball bearing in pedestal of M3 Mount.
- (12) Elevating parts of mounts.
- (13) Recoil mechanisms of mounts.

## OPERATION UNDER UNUSUAL CONDITIONS

b. In temperatures below zero F, the unpainted metal parts of the gun and mount should be disassembled daily as far as necessary, and completely cleaned with SOLVENT, dry-cleaning, to remove all oil, grease, and fouling. The parts should then be thoroughly dried with clean rags to remove the solvent, and immediately oiled, using a clean dry lintless CLOTH, wiping, saturated in OIL, lubricating, preservative, light, and then wrung out. This oil should then be removed with a clean dry lintless wiping cloth. Working surfaces of parts showing signs of wear may then be lightly lubricated by rubbing lightly with an oiled cloth as above. At temperatures above zero F, a light coating of oil may be allowed to remain on the unpainted surfaces of guns and mounts, after cleaning.

c. Ordinarily, guns and mounts, when not in use, should remain outdoors and be carefully covered with covers provided, a tarpaulin, or other waterproof covering; or else, moved into a cold building or shed, to avoid condensation of moisture due to change in temperature. If necessary to move the gun or mounts into heated buildings for cleaning, adjustment, or repair, they should be allowed to come to room temperature, and then be disassembled as far as necessary to wipe off all moisture which will have condensed on the cold metal surfaces. When completely dry, the unpainted surfaces should be lightly oiled to prevent rusting, as prescribed in subparagraph b above. If so oiled, the oil should be wiped off before moving the materiel outdoors again. If the gun has been fired, the bore may be swabbed out with an oiled cloth as soon as brought indoors, and then, when the gun has reached room temperature, it can be thoroughly cleaned and oiled as prescribed in paragraphs 30 and 32.

d. Before setting the gun and mount up outdoors, all oil should be wiped off parts, and the contacting surfaces of operating parts lightly oiled as prescribed in subparagraph b above. *The bore and chamber must be wiped entirely free of oil before firing.*

e. Care must be observed to see that the cooling fluid in the water jacket and water chest does not freeze, as damage to gun or chest may result (par. 118). For proper care, and cooling fluid for cold weather refer to paragraph 38 a.

f. The oil buffer must be watched with regard to adjustment, to insure proper functioning of the gun. For adjustment of the oil buffer and recoil oil used, refer to paragraphs 36 and 37.

## 115. CLEANING AND LUBRICATION IN HOT CLIMATES.

### a. Tropical Climates.

(1) In tropical climates, where temperatures and humidity are high, or where salt air is present, or during rainy seasons, the guns and mounts should be inspected daily and kept copiously oiled when not



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in use. The groups should be dismounted at regular intervals, and disassembled sufficiently to enable thorough cleaning, drying, and oiling of the parts. Oiling is best accomplished by saturating a clean dry lintless wiping cloth, with light preservative lubricating oil, and then wringing out. Care should be observed to see that cloths used are *absolutely dry* (free of moisture).

(2) Care should be exercised to see that unexposed parts and surfaces are kept clean and oiled to prevent rusting, and thus possible sticking or "freezing." Especial care should be observed with respect to the parts referred to in paragraph 114 a.

(3) Any rust spots should be cleaned off immediately, and the surface, if bright, should be polished, and then oiled. If rust is not completely removed, it will accumulate and eat into the metal. Special care should be taken with the bore and chamber of the barrel. Light rust may be removed with CLOTH, crocus. Care should be exercised not to scratch the surface unduly.

(4) Screws, belts, or pins, when removed should be thoroughly cleaned and oiled before assembling to prevent rusting and "freezing" in place.

(5) Water chest hoses should be kept absolutely free of oil, as it will attack rubber.

(6) Care should be observed to see that wiping cloths used for cleaning are *absolutely dry* (free of moisture) and free from lint.

**b. Hot Dry Climates.**

(1) In hot dry climates, where sand and dust are apt to get into the mechanism of gun and mount and the bore of the gun, the gun and mount should be wiped clean daily, or oftener if necessary. Groups should be dismounted and disassembled as far as necessary to assure thorough cleaning, oiling, and lubrication should be kept at a minimum.

(2) When materiel is being used under sandy conditions, all lubricants should be wiped off, and the contacting surfaces of moving parts lubricated just sufficiently to insure proper operation and functioning. Such light lubrication may be accomplished in a manner similar to that prescribed for materiel when used in climates below zero F, paragraph 114 b. Excess oil or lubrication will collect dust or sand carried by the wind, and form an abrasive compound which will ruin the mechanism. Under such conditions, the materiel should be cleaned *often* and relubricated as above. When not being fired, materiel should be kept carefully covered, if conditions permit.

(3) Perspiration from the hands is a contributing factor to rust, because it contains acid. Therefore, metal parts handled should be inspected frequently for signs of rusting.

(4) During sand or dust storms, and when transporting through dusty and sandy areas, materiel should be carefully and completely

## OPERATION UNDER UNUSUAL CONDITIONS

covered with cover provided, a tarpaulin or similar covering, with especial care for the gun, recoil and trigger control mechanisms of the mounts, and the sight mechanism of the M2 Mount.

c. Special attention should be given the oil buffer, water jacket, and water chest and fluids used therein, to insure proper functioning of the gun. For adjustment of oil buffer and care of cooling system refer to paragraphs 37 and 38.

### 116. CARE WHEN LOCATED NEAR SALT WATER.

a. When gun and mount are located near salt water, where salt air, spray, or fog is prevalent, it should be inspected daily, and oiled if necessary, as when used in tropical climates (par. 115 a).

b. If exposed to spray, as when mounted on a water front or vessel, the unpainted metal parts of gun and mount, with the exception of moving parts, and contacting surfaces, may be oiled with OIL, lubricating, preservative, medium. This oil is heavier bodied than light preservative lubricating oil, and will resist salt water longer. It should, however, not be used on moving parts, as they will not function as well unless the temperature is high. Light preservative lubricating oil should be used for lubrication of moving parts as prescribed in paragraph 32. In freezing temperatures, oiling and lubrication should be accomplished as prescribed in paragraph 114.

### 117. CARE OF THE OIL BUFFER.

a. **In Cold Climates.** When temperatures are low, the viscosity of the buffer oil in the oil buffer may increase to the point where the resistance of the oil will impede the recoil of the recoiling parts, and so cause the gun to function sluggishly, or even cause a stoppage. This is especially so until the gun has warmed up in firing. In such cases, it may be necessary to reduce the resistance to recoil by opening the throttling ports in the piston valve and head to allow the oil to pass more freely. This is accomplished by inserting a screwdriver through the hole in the lower end of the back plate, engaging it with the slot in the rear end of the oil buffer tube, and turning the tube counter-clockwise a click or two at a time, until the rate of fire of the gun is increased sufficiently to produce proper functioning. Such adjustment should, however, not be made, if possible, until the gun warms up, as friction at other points may cause sluggish functioning. If made on a cold gun, it may have to be further adjusted when the gun warms up.

b. **In Hot Climates.** When temperatures are high, the viscosity of the buffer oil in the oil buffer will decrease, and the rate of fire of the gun may, therefore, increase to the point where it does not function properly, or the recoiling parts will slam. In such a case the flow of oil through the throttling ports should be gradually cut down by turn-

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ing the oil buffer tube *clockwise*, in a similar manner to that explained in subparagraph a above.

c. For explanation of the functioning and adjustment of the oil buffer refer to paragraph 37.

**118. CARE OF THE WATER JACKET AND CHEST.**

a. **In Cold Climates.** Where the temperatures are below freezing, or when freezing temperatures are apt to occur suddenly, care must be observed to guard against freezing of the cooling fluid in the water jacket of the gun and in the water chest. Such freezing may damage the gun and jacket, and distort or fracture the steam tube. In freezing temperatures, or where such are possible overnight, an antifreeze solution should be used in place of water as prescribed in paragraph 38 a. In addition, the gun and chest should be well covered at night, and when not in use, where conditions permit.

**b. In Hot Climates.**

(1) Where temperatures are high, care must be observed to keep the water jacket and chest full, as evaporation will be increased.

(2) Care should be observed to use clean water, and where circumstances permit, the circulating system should be flushed out occasionally and refilled with clean water.

(3) Care should be observed not to pour *cold* water into the water jacket of a hot gun, as cracking may occur due to quick contraction of the metal due to the sudden change in temperature.

## Section XV

### PAINTING

	Paragraph
General .....	119
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#### 119. GENERAL.

a. Ordnance materiel is painted before issue to the using arms, and one maintenance coat per year will ordinarily be ample for protection. With but few exceptions, this materiel will be painted with **ENAMEL**, synthetic, olive-drab, lusterless. The enamel may be applied over old coats of long oil enamel and oil paint previously issued by the Ordnance Department if the old coat is in satisfactory condition for repainting.

b. Paints and enamels are usually issued ready for use, and are applied by brush or spray. They may be brushed on satisfactorily when used unthinned in the original package consistency, or when thinned no more than 5 percent by volume with **THINNER**, for synthetic enamels. The enamel will spray satisfactorily when thinned with 15 percent by volume of thinner. (Linseed oil must not be used as a thinner since it will impart a luster not desired in this enamel.) If sprayed, it dries hard enough for repainting within  $\frac{1}{2}$  hour and dries hard in 16 hours.

c. Complete information on painting is contained in TM 9-850.

#### 120. PREPARING FOR PAINTING.

a. If the base coat on the materiel is in poor condition, it is more desirable to strip the old paint from the surface than to use sanding and touch-up methods. After stripping, it will then be necessary to apply a primer coat.

b. **PRIMER**, synthetic, rust-inhibiting, should be used on bare metal as a base coat for synthetic enamel. It may be applied either by brushing or spraying. It will brush satisfactorily as received, or after the addition of not more than 5 percent by volume of **THINNER**, paint, volatile mineral spirits. It will be dry enough to touch in 30 minutes, and hard in 5 to 7 hours. For spraying, it may be thinned with not more than 15 percent by volume of thinner. Enamel must not be applied to the rust-inhibiting synthetic primer, within less than 48 hours.

**BROWNING MACHINE GUN, CAL. .50, M2, WATER-COOLED, AND MOUNTS**

c. The success of a job of painting depends partly on the selection of a suitable enamel, but also largely upon the care used in preparing the surface prior to painting. All parts to be painted should be free from rust, dirt, grease, kerosene, oil, and alkali, and must be dry.

**121. PAINTING METAL SURFACES.**

a. If metal parts are in need of cleaning, they should be washed in a liquid solution consisting of  $\frac{1}{2}$  pound of **SODA ASH** in 8 quarts of warm water, or an equivalent solution, then rinsed in clear water and wiped thoroughly dry. When painted portions are in fair condition and only marred in spots, the bad places should be touched with lusterless olive-drab synthetic enamel, and permitted to dry. The whole surface will then be sandpapered with **PAPER**, flint, No. 1 and a finish coat of lusterless olive-drab synthetic enamel, applied, and allowed to dry thoroughly before the materiel is used. If the materiel is in bad condition, all painted parts should be thoroughly sanded with **PAPER**, flint, No. 2, or equivalent, given a coat of **PRIMER**, synthetic, refinishing, and permitted to dry for at least 16 hours. They will then be sandpapered with **PAPER**, flint, No. OO, wiped free from dust and dirt, and a final coat of lusterless applied, olive-drab synthetic enamel, and allowed to dry thoroughly before the materiel is used.

**122. PAINT AS A CAMOUFLAGE.**

a. Camouflage is now a major consideration in painting ordnance materiel, with rust prevention secondary. The camouflage plan at present employed, utilizes three factors: Color, gloss, and stenciling.

(1) **COLOR.** Materiel is painted with lusterless olive-drab synthetic enamel, which was chosen to blend in reasonably well with the average landscape.

(2) **GLOSS.** The new lusterless enamel makes materiel difficult to see from the air or from relatively great distances over land. Materiel painted with ordinary glossy paint can be detected more easily and at greater distances.

(3) **STENCILING.** White stencil numbers on materiel have been eliminated because they can be photographed from the air. **ENAMEL**, synthetic, stenciling, lusterless, blue-drab, is now used, which cannot be so photographed. It is illegible to the eye at distances exceeding 75 feet.

(4) **PRESERVING CAMOUFLAGE.**

(a) Continued friction or rubbing must be avoided, as it will smooth the surface and produce a gloss. The materiel should not be washed more than once a week. Care should be taken to see that the washing is done entirely with a sponge or a soft cloth. The surface

## **PAINTING**

should never be rubbed or wiped, except while wet, or a gloss will develop.

(b) It is not desirable that materiel, painted with lusterless enamel, be kept as clean as materiel was kept when glossy paint was used. A small amount of dust increases the camouflage value. Grease spots should be removed with **SOLVENT**, dry-cleaning. Whatever portion of the spot cannot be so removed, should be allowed to remain.

(c) Continued friction of wax-treated tarpaulins will also produce a gloss, which should be removed with dry-cleaning solvent.

(d) Tests indicate that repainting with lusterless olive-drab synthetic enamel, will be necessary once yearly; with blue-drab lusterless stenciling synthetic enamel twice yearly.

### **123. REMOVING PAINT.**

a. After repeated paintings, the enamel may become so thick as to crack and scale off in places, presenting an unsightly appearance. If such is the case, remove the old enamel by use of a lime-and-lye solution (see **TM 9-850** for details) or **REMOVER**, paint and varnish. It is important that every trace of lye or other paint removed be completely rinsed off, and that the equipment be perfectly dry before repainting is attempted.

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- e. **Inspection and Maintenance.**  
Inspection of Ordnance Materiel ..... TM 9-1100  
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- f. **Instruction Guide: small arms data** ..... TM 9-2200
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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,  
*Chief of Staff.*

OFFICIAL:

J. A. ULIO,  
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The Adjutant General.*

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(For explanation of symbols, see FM 21-6.)

## NOTES







